BIOLOGICAL ASSESSMENT / BIOLOGICAL EVALUATION

FOR

THREATENED, ENDANGERED, PROPOSED, AND SENSITIVE FISH SPECIES THAT MAY BE AFFECTED

BY THE

TRINITY ALPS WILDERNESS PRESCRIBED FIRE PROJECT

Trinity River Management Unit
Shasta-Trinity National Forest

June 5, 2012

Prepared by: ______________________________ Date______________
Francine Smith, Fisheries Biologist
USFS ACT2 Enterprise Unit

Reviewed by: ______________________________ Date______________
William Brock, Fisheries Biologist
USFS Shasta-Trinity National Forest
Fisheries/Aquatics Program Manager

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PROJECT NAME:	Trinity Alps Wilderness Prescribed Fire Project
ADMINISTRATIVE UNIT:	Shasta-Trinity National Forest (STNF), Trinity River Management Unit
FIFTH FIELD WATERSHEDS:	New River
SEVENTH FIELD WATERSHEDS:	Eightmile Creek; North Fork Eagle Creek; Sixmile Creek-Virgin Creek; Eagle Creek-Slide Creek; Lower Slide Creek; Twomile Creek-Virgin Creek; Barron Creek-Caraway Creek; Quinby Creek
LEGAL LOCATION:	Shasta-Trinity National Forest, Humboldt Meridian: T70N R70E Sections 1 through 24; T70N R80E Sections 6, 7; T80N R60E Sections 1, 11, 12, 13, 14, 23, 24; T80N R70E Sections 1 through 36; T80N R80E Sections 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31 and 32; T90N R60E Sections 24, 25; T90N R70E Sections 17 through 36; T90N R80E Sections 29, 30, 31, 32; and Mount Diablo Meridian: T370N R120W Sections 6, 7, 8, 17, 18, 19, 20, 29, 30; T380N R120W Section 31.
WATERSHED ANALYSES:	New River Watershed Analysis (USDA Forest Service 2000)
NEPA DOCUMENTATION:	Trinity Alps Wilderness Prescribed Fire Project Environmental Assessment
ESA SPECIES CONSIDERED:	Endangered: None Threatened: Southern Oregon Northern California Coast (SONCC) coho salmon Proposed: None
ESA CRITICAL HABITAT:	SONCC coho salmon Critical Habitat
ESSENTIAL FISH HABITAT:	Coho and Chinook salmon
ESA DETERMINATIONS:	May Affect but is Not Likely to Adversely Affect SONCC coho salmon and its designated Critical Habitat.
USFS SENSITIVE SPECIES CONSIDERED:	Upper Klamath/Trinity (UKT) Chinook salmon-spring run Upper Trinity River (UTR) Chinook salmon-fall run Klamath Mountain Province (KMP) steelhead trout
SENSITIVE SPECIES DETERMINATIONS:	The Trinity Alps Wilderness Prescribed Fire Project is not likely to result in a trend toward listing or loss of viability of Forest Service sensitive fish species.
ESSENTIAL FISH HABITAT:	The project will not adversely affect Chinook or coho salmon Essential Fish Habitat (EFH).

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I. Introduction

The purpose of this biological assessment/biological evaluation (BA/BE) is to determine effects of the Shasta-Trinity National Forest's (STNF) Trinity Alps Wilderness Prescribed Fire Project (the Project) on anadromous fish species listed under the *Endangered Species Act* (ESA) as Threatened, on designated critical habitat for ESA listed anadromous salmonids, on Essential Fish Habitat (EFH) for coho and Chinook salmon, and on species listed as "Sensitive" by the Pacific Southwest Region of the United States Department of Agriculture (USDA) Forest Service. The effects of Alternative 3, which is the preferred alternative, were addressed. Should Alternative 2 ultimately be selected for implementation, adverse effects would be equal to or slightly less than those described in this document, since fewer acres would be treated (see Alternative 2 map, Figure A-1 in Appendix A). Beneficial effects would also be slightly less under Alternative 2, because fuel reduction would be accomplished on fewer acres.

The proposed project activities are located in the northwest corner of the Trinity Alps Wilderness. The project area comprises approximately 11 percent of the entire wilderness – approximately 58,350 acres. The Trinity Alps Wilderness Prescribed Fire Project includes a combination of maintenance of existing trails/firelines by non-mechanized methods (with chainsaws used only for safety considerations) and aerial and/or hand ignition of prescribed fire on approximately 19,088 acres under Alternative 3. The overall goals of the Project are to: 1) reduce the risks and consequences of wildfire occurring within the wilderness or escaping from the wilderness; 2) create a fuels condition that enables the use of minimum impact suppression tactics that make use of natural barriers, topography or watercourses; 3) permit lightning-caused fires to play, as nearly as possible, their natural ecological role within wilderness; and 4) reduce the risks and consequences of public health and safety concerns created by hazardous air conditions.

The 5th-field and 7th-field watershed names and hydrologic unit codes (HUC) where Project activities would occur are shown in Table 1 below.

Table 1. Trinity Alps Wilderness Prescribed Fire Project Area 5th - and 7th - Field Watersheds and Hydrologic Unit Codes (HUC).

5th Field Watershed	HUC	Watershed Acres
New River	1801021110	149,359
7th Field Watersheds	**HUC**	**Watershed Acres**
Eightmile Creek	18010211100101	6,967
Sixmile Creek-Virgin Creek	18010211100102	9,525
Lower Slide Creek	18010211100203	8,254
Twomile Creek-Virgin Creek	18010211100103	7,506
Barron Creek-Caraway Creek	18010211100402	10,587
North Fork Eagle Creek	18010211100201	7,697
Eagle Creek-Slide Creek	18010211100202	10,056
Quinby Creek	18010211100401	5,630

This BA/BE has been prepared in accordance with legal requirements set forth under Section 7 of the ESA of 1973, as amended (16 United States Code [USC] 1531 et. seq.; 50 Code of Federal Regulations [CFR] 402), EFH consultation under 305(b) (4) (A) of the Magnuson-Stevens Fishery Conservation and Management Act; and is consistent with standards established in Forest Service Manual direction (FSM 2672.42; USDA Forest Service 2009). The ESA fish species list for this BA/BE was obtained online at http://www.nwr.noaa.gov/ESA-Salmon-Listings/ (March 1, 2012), and the Sensitive species list is from the USDA Pacific Southwest Region Sensitive Species List, October 2007.

This BA/BE analyzes effects on the following anadromous salmonid Evolutionarily Significant Units (ESU) or Distinct Population Segments (DPS) and their habitat in the action area that have special status under the ESA or are given special management consideration as Forest Service Sensitive species:

Threatened: Southern Oregon Northern California Coasts (SONCC) coho salmon (*Oncorhynchus kisutch*) ESU and its designated critical habitat.

Sensitive: Upper Klamath Trinity (UKT) Rivers Chinook salmon (*O. tshawytscha*), Klamath Mountain Province (KMP) steelhead trout (*O. mykiss*)

Essential Fish Habitat: All coho salmon and Chinook salmon ESUs.

Terms

Project Area: The 58,350 acre portion of the Trinity Alps wilderness that is bounded by the defensible land features **(**ridgetops) of the Klamath National Forest boundary to the north and northeast, the Six Rivers National Forest boundary to the northwest, the wilderness boundary to the southwest, and the main ridge line between Election Gap and the New River on the southeast (see Figure A-2 in Appendix A for a map of the Project area).

Treatment Area: Areas comprising the acres proposed for fuels reduction treatments.

Action Area: The Action Area is defined (for ESA purposes) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved action" (50 CFR 402). The Action Area for this BA/BE includes the project area plus anadromous fish habitat downstream that could be affected by the proposed action.

Project Elements: For ESA purposes, refers to the various *types* of proposed fuel reduction treatments (and related activities) in the Trinity Alps Wilderness Prescribed Fire Project assessment area. See the section below titled "Primary Project Elements of the Proposed Action.

II. Consultation to Date

The Trinity Alps Wilderness Prescribed Fire Project is consistent with the March 19, 2004, Biological Opinion issued by National Marine Fisheries Service (NMFS) for the STNF's Land and Resource Management Plan (LRMP). The March 19, 2004, BO does not authorize any incidental take of listed species, and an incidental take statement is not included. Individual land management actions, groups of actions, and programmatic actions are to be consulted upon subsequently using appropriate analytical methods, in accordance with the procedures established in the Interagency Cooperation regulations for implementing section 7 of the ESA (50 CFR 402), as well as interagency agreements and guidance on streamlining consultation with the action agencies.

The March 19, 2004, BO further states that effects on salmonids at the site scale will be analyzed in future project-level section 7 consultations. To fulfill obligations under section 7(a)(2) of the ESA for individual or groups of projects, and to be exempt from Section 9 take prohibitions, the administrative units may use the interagency consultation streamlining guidance (1999) or subsequent updated procedures to avoid jeopardizing the continued existence of listed salmonids. Interagency Level 1 teams evaluate the effects of proposed actions against the environmental baseline at project and watershed scales.

An Analytical Process (AP; USDA-USDOC-USDI 2004) was established on November 5, 2004, for timber sales that "may affect" listed salmonid species within the Northwest Forest Plan area to address lawsuits and rendered decisions. The STNF immediately expanded the use of the very thorough Guide and followed the Analytical Process to assess effects of the Project in this BA/BE.

The Analytical Process replaces the 1996 Matrix of Pathways and Indicators (NMFS 1996) with a "Tables of Population and Habitat Indicators for Use in the Northwest Forest Plan Area." The Table describes the Primary Constituent Elements of critical habitat for coho salmon, as well as the important elements necessary for analysis of habitat for steelhead trout, Chinook salmon, and EFH. The Table provides values and ranges of conditions of indicators to determine whether baseline conditions are "Properly Functioning," "At Risk," or "Not Properly Functioning." In project-level analyses, these values and range of conditions describe the range of variability for anadromous fish habitat.

The range of criteria presented in the Analytical Process is not absolute and may be adjusted for local watersheds given supportive documentation. The STNFalso kept and adjusted, in cooperation with input from NMFS in 2006, the Matrix of Pathways and Indicators that had preceded the AP to reflect local geologic and climatic influences on aquatic habitat and watershed conditions within the Trinity River basin physiographic area to determine "Properly Functioning" indicator conditions for anadromous fish streams on the STNF. Values were also estimated for "At Risk" and "Not Properly Functioning" indicator conditions (see Appendix G of this BA/BE). In some cases, a stream's morphology, aspect or size may not support "Properly Functioning" criteria values for one or more habitat Indicators. If an indicator for a particular stream is determined by the project fisheries biologist to be functioning at its capability (due to morphology, aspect, or size), it is rated as "Properly Functioning" even if it does not meet criteria values in the Table (Appendix A of the Analytical Process). For this BA/BE a table was developed for the Trinity River because it is the only watercourse in the Analysis Area that is accessible to anadromous salmonids (see Appendix E of this BA/BE).

In addition to habitat Indicators, the AP Table in USDA-USDC-USDI 2004 contains a population Indicator: Population Characteristics, which includes population size and distribution, growth and survival, life history diversity and isolation, and persistence and genetic integrity. The Population Characteristics Indicator is not currently included in BA/BEs for listed anadromous salmonids where no recovery plans are completed because guidance is given in the Table as follows: "these (population characteristics) are for bull trout only; however, NOAA FISHERIES gathers similar types of data and placing salmon and steelhead information into these categories may suffice. There may be other data necessary to collect or collect differently for salmon or steelhead (e.g., run timing and spatial distribution data).

As recovery plans are developed the intent of this pathway is to be consistent with population terminology within recovery plans." NMFS (level 1 coordination in July 2009) noted that "until Federal recovery plans are available for listed species of interest, an effort should be made to incorporate the best scientific information about population condition and trend in the status of the species section of consultation document. The best available scientific information about population condition and trend has been incorporated in the status of the species section of consultation documents. This will continue until the SONCC coho salmon recovery plan is finalized and released."

In addition, this BA/BE determined that the project would have no adverse effect to individuals or populations. However, existing information on population conditions and trends for anadromous salmonids is given in NMFS' status reviews (Busby et al. 1996; Good et al. 2005; Myers et al 1998; Weitkamp 1995), which are cited in this BA/BE and therefore are incorporated by reference, and information from status reviews is summarized in Appendix F of this BA/BE as required.

The project was verbally introduced to the NMFS Level 1 representative, Catherine McGourty on September 7, 2011 at a meeting in Willow Creek. A Project Information Form and maps of fish range and project riparian reserves were also reviewed. The results of field surveys relevant to the project area were sent to Ms. McGourty on September 9, 2011.After verbal agreement, informal consultation was initiated on June 14, 2012 when the completed biological assessment was sent to Ms McGourty at the NMFS address in Arcata. A letter of concurrence was received on August 9, 2012, signed by the NMFS Northern California Office Supervisor.

III. Proposed Action

Type of Project: Fuels Reduction

Under Alternative 3, which is the preferred alternative, approximately 19,088 acres of the Trinity Alps Wilderness are proposed for prescribed fire. Treatments were designed to meet desired conditions by increasing the landscape's resilience to severe wildfire, restoring fire to the ecosystem and decreasing surface and ladder fuels in strategic locations – such as major ridgelines – to help reduce fire risks and consequences. Implementation of the proposed action would likely occur over a period of six to ten years. See Figure A-2 in Appendix A for a map of treatment areas under Alternative 3.

Project Summary and Primary Project Elements

The Trinity Alps Wilderness Prescribed Fire Project includes three primary project elements:

- Prescribed Fire Treatments
- Existing Trail and Fireline Maintenance
- Danger (Hazard) Tree Removal

Minimum Impact Suppression Tactics (National Wildfire Coordinating Group 2003) and Forest Service Manual (FSM) 2324.23 direction for fire management activities in wilderness would be followed during all phases of implementation. In accordance with these two guides, the Forest Service would employ methods that cause the least amount of disturbance or alteration of wilderness characteristics that can be used safely and effectively to implement the proposed action.

Design features applicable to all action alternatives include BMPs, Wet Weather Operation Standards, Forest-wide soil cover standards, as well as LRMP Standards and Guidelines. Application of these measures will minimize the impacts of each action alternative on aquatic resources considered herein.

Prescribed Fire Treatments. Proposed treatments consist of lighting prescribed fire on ridge tops to create a mosaic burn severity pattern, primarily of low- to moderate-intensity surface fire. Some treatment areas propose allowing fire to back downhill to stream channels.

Prescribed fire would consist of hand and/or aerial ignition. Hand lighting involves ground personnel using fire ignition tools, generally a drip torch filled with an approved burn mix, which requires personnel to manually walk in the prescribed burn area to light the fire. The primary method of ignition for this project would be aerial using plastic sphere dispensers. This technique is designed for rapid, low-cost ignition of fine fuel over large areas. Plastic spheres (ping-pong balls) containing potassium permanganate are injected with ethylene glycol (antifreeze) as they are ejected from a helicopter. After a delay of about 20 seconds, a chemical reaction causes the plastic spheres to ignite.

Another type of aerial ignition device that may be used is a helitorch; a large driptorch and drum of gelled gasoline mounted or slung under a helicopter. This system emits a steady stream of burning fuel globs. Helicopters would be used for both ignition and logistical support (e.g. cargo nets attached to a longline for delivery of supplies and or back haul of supplies and trash). No new helispots would be constructed. Helicopters would not be anticipated to land on existing helispots within the wilderness except in an emergency or for safety considerations.

Proposed Treatments by Treatment Area:

Salmon Summit to Election Gap – Implement prescribed fire of low-to-mixed severity with fire predicted to back downhill approximately 1,000 feet from the main ridgetop.

This is a strategic major ridgeline for fire suppression. Much of the area has a high density of large snags and fuel loading, primarily due to the 1999 Megram Fire and suppression line during the 2009 Backbone Fire. Reducing fuel loading is necessary for this ridgeline to serve as a future functional suppression line. It also has a major trail system that allows minimum impact suppression tactics both for the implementation of prescribed fire and for future wildfire suppression.

Election Gap to New River – Implement prescribed fire of low-to-mixed severity with fire predicted to back downhill approximately 1,000 feet from the main ridgetop.

This is a strategic ridgeline to hold fire in the future. This ridgeline burned most recently in the 2006 Bake-Oven Complex. Maintaining low fuel loadings is necessary to use this ridgeline in future fire suppression efforts.

Salmon Summit to Fawn Ridge – Implement prescribed fire of low-to-mixed severity with fire predicted to back downhill approximately 1,000 feet from the main ridgetop.

Portions of this ridgeline burned in the 2009 Backbone Fire. Much of the area has a high density of large snags and fuel loading where the Backbone Fire did not burn and suppression line was put in place. This is a major ridgeline and strategic place for holding future fires. It also has a major trail system that allows minimal suppression tactics for both the implementation of prescribed fire and future wildfire suppression.

Megram Ridge – Implement prescribed fire of low-to-mixed severity using ridge-top ignitions on Megram Ridge. Fire would be predicted to back downhill as far as the Virgin Creek / Slide Creek confluence to the south, Virgin Creek to the west, the Salmon Mountain ridgetop north to the Salmon Summit Scenic trail, and Slide Creek or North Fork Creek to the east.

This is a strategic ridgeline that separates two 6th field watersheds. The proposed treatment would increase the likelihood of fire holding on this major ridgetop. In addition, Virgin Creek, Slide Creek, and North Fork Creek have historically served as successful suppression lines. Reducing fire behavior potential along these creeks would maintain future holding lines and reduce cumulative watershed effects from future wildfires.

Barron Creek – Implement prescribed fire of low-to-mixed severity using ridge-top ignitions on Fawn Ridge and/or the ridgeline separating Barron Creek and Quimby Creek drainages. Fire would be predicted to back downhill to the Wilderness / project boundary to the south, New River to the east, Fawn Ridge to the north, and the ridgeline separating Barron and Quimby Creek drainages to the west.

Fawn Ridge and the ridgeline separating Barron Creek and Quimby Creek drainages have historically been used as fire suppression ridges. However, much of the area has high density of large snags and heavy fuel loading. This is primarily due to the 1999 Megram Fire and suppression line construction during the 2009 Backbone Fire. Reducing fuel loading is necessary for this ridgeline to serve as a functional suppression line in the future. These ridges are the last major ridgelines south of the Trinity Alps Wilderness that could be held to keep fire in the wilderness and out of nearby communities at risk such as Denny.

Wilderness boundary to Virgin Creek (Two Mile Ridge, Six Mile Ridge and Soldier Ridge) – Implement prescribed fire of low-to-mixed severity using ridge-top ignitions. Fire would be predicted to back down either side of this sub-ridge approximately 1,000 feet. Fire would be allowed to back down to Virgin Creek.

Due to the location, slope steepness, and orientation of the topography, Two Mile, Six Mile and Soldier ridges are the only few sub-ridges in the western side of the Virgin Creek drainage suitable for accessing and potentially holding fires. By treating these three areas, future fires within the larger Virgin Creek drainage area would become more self-regulated in size through interaction with previous treatments and/or fires. The westernmost portion of these ridgelines burned in the 2009 Backbone Fire. Much of the area has a high density of large snags and fuel loading where the Backbone Fire did not burn, currently making it difficult for firefighters to use the ridges for access during initial and extended attack.

Existing Trail and Fireline Maintenance. Existing trails and existing fireline would be used as holding and contingency lines during project implementation (no new fireline construction is proposed). Maintenance of these existing features may be required and would include slashing of brush, pruning, lop and scatter, and dispersal of large downed wood – all of which would be by hand. Chainsaws would only be used where use of hand saws is deemed unsafe.

Danger (Hazard) Tree Removal. The felling of danger trees (live or dead) during project implementation is expected to be an uncommon occurrence. Any trees identified as danger trees would be avoided where possible. Only trees that cannot be avoided and meet the definition of hazards to fire management personnel during project implementation would be felled. Those that cannot be avoided would be felled in a manner consistent with Minimum Impact Suppression Tactics.

Where possible, danger trees would be blasted to avoid the unnatural appearance of stumps. This is the preferred treatment for danger trees in wilderness areas. Where blasting is not possible or is considered unsafe, danger trees would be cut with stumps as close to the ground as possible; stumps would then be covered with on-site vegetation or other materials. Trees would be felled using hand saws unless it is determined on a site-specific basis that use of chainsaws is necessary for safety reasons.

Table 2 below displays the total number of acres proposed for prescribed fire treatments by watershed. The number of acres of riparian reserves proposed for prescribed fire treatments is also shown. Existing trail and fireline maintenance and danger tree removal actions will occur only where necessary within the project area and will be limited to very small acreage areas.

Table 2. Summary of Proposed Prescribed Fire Treatment Acres – Alternative 3

Watershed Name	Total Watershed Acres	Total Acres Proposed for Prescribed Fire Treatments	% of Watershed Proposed for Prescribed Fire Treatments	Acres of Riparian Reserves Proposed for Prescribed Fire Treatments
5th Field Watershed				
New River	**149,365**	**19,064***	**13%**	**4,506**
7th Field Watersheds within the Project Area				
Eightmile Creek	6,967	1,328	19%	202
Sixmile Creek-Virgin Creek	9,525	5,050	53%	1,383
Lower Slide Creek	8,254	1,525	18%	418
Twomile Creek-Virgin Creek	7,506	3,000	40%	741
Barron Creek-Caraway Creek	10,587	2,706	26%	526
North Fork Eagle Creek	7,697	4,299	56%	1,063
Eagle Creek-Slide Creek	10,056	1,150	11%	173
Quinby Creek	5,630	6	<1%	0

* Actual proposed treatment acres under Alternative 3 are 19,088- the discrepancy is due to the nature of the hydrologic unit data layer as it overlays the project area.

Location

The Trinity Alps Wilderness Prescribed Fire Project is located in the Shasta-Trinity National Forest, Trinity River Management Unit in Trinity, Siskiyou, and Humboldt Counties, California. The project area encompasses the Upper New River, Eagle Creek, and Sixmile Creek 6th field watersheds and comprises approximately 11 percent of the Trinity Alps Wilderness – about 58,350 acres. The project area is located entirely within the Trinity Alps Wilderness and consists primarily of federal lands, excluding some small private inholdings. The project area is bounded by the defensible land features (ridgetops) of the Klamath National Forest boundary to the north and northeast, the Six Rivers National Forest boundary to the northwest, the wilderness boundary to the southwest, and the main ridge line between Election Gap and the New River on the southeast. See Figure A-2 in Appendix A of this BA/BE,which shows the project area and treatment areas under Alternative 3.

The legal description of the project area is as follows:

Humboldt Meridian

T70N R70E Sections 1 through 24

T70N R80E Sections 6 and 7

T80N R60E Sections 1, 11, 12, 13, 14, 23 and 24

T80N R70E Sections 1 through 36

T80N R80E Sections 4, through 9, 16 through 21, and 28 through 32

T90N R60E Sections 24 and 25

T90N R70E Sections 17 through 36

T90N R80E Sections 29, 30, 31, and 32;

Mount Diablo Meridian

T370N R120W Sections 6, 7, 8, 17, 18, 19, 20, 29 and 30

T380N R120W Section 31.

Elevations range from about 1500 feet to 6700 feet.

Project Timing

Project activities are scheduled to occur in the spring and/or fall when burn conditions are appropriate. Prescribed burning activities will be restricted from February 1 to September 15 where suitable habitat for the northern spotted owl may be impacted. Project activities are proposed outside of the normal operating period for SONCC coho salmon (April 15 through October 15) in areas near designated coho salmon critical habitat and in riparian reserve designations if appropriate ignition conditions exist. The timing of actual fire ignition would be determined based on current and predicted weather conditions, fuels conditions, and compliance with State and federal air quality standards, with the intent to create primarily low- to moderate-intensity surface fires that would trend the project area toward desired conditions.

A detailed prescribed fire implementation plan (burn plan) would be completed prior to implementation of prescribed fire. The burn plan would include all elements required by Forest Service Manual (FSM) 5140 and the Interagency Prescribed Fire Planning and Implementation Procedures Guide.

Wet Weather Operation Standards will be followed whenever activities occur outside of the normal operating season. Favorable forecast periods must be of a suitable length to allow for either Project completion, or preparation of the site for resisting erosion during upcoming winter storms.

Resource Protection Measures

See Chapter 2 in the Environmental Assessment for a list of all resource protection measures that have been included in the Proposed Action to avoid or minimize impacts on SONCC coho salmon and their critical habitat, and EFH in the short and long term, as well as other sensitive resources.

Management Direction

Forest Plan direction along with STNF fire and fuels data and field reviews were used to develop the proposed action. Proposed activities would occur within Forest Wilderness Areas – Trinity Alps Wilderness and Riparian Reserve land allocations.

In the Wilderness Areas land allocation, fire management is prescriptive, allowing wildfire to perform its ecological function within defined parameters. For actions in the wilderness, the Forest promotes minimum impact suppression methods that make use of natural barriers, topography or watercourses. Forest Service Manual (FSM) 2324.23 – Fire Management Activities (USDA Forest Service 2007) directs the Forest Service to: Conduct all fire management activities within wilderness in a manner compatible with overall wilderness management objectives. Give preference to using methods and equipment that cause the least: alteration of the wilderness landscape; disturbance of the land surface; disturbance to visitor solitude; reduction of visibility during periods of visitor use; adverse effect on other air quality-related values. Locate fire camps, helispots, and other temporary facilities or improvements outside of the wilderness boundary whenever feasible. Rehabilitate disturbed areas within wilderness to as natural an appearance as possible.

For riparian reserves, the Forest Plan provides direction to maintain and restore conditions described in the nine Aquatic Conservation Strategy objectives. This BA/BE addresses how the Project meets (or attains) the nine ACS objectives (see Appendix D). BMPs and all water quality guidelines will be followed.

Watershed Analysis

The Project was developed with consideration of information and recommendations contained in the New River Watershed Assessment (USDA Forest Service 2000). Information on existing conditions in anadromous salmonid watersheds is contained in the New River Watershed Assessment and is incorporated herein by reference.

In addition, further information on existing conditions for the Trinity River basin is contained in the document titled: Trinity River Total Maximum Daily Loads for Sediment (EPA 2001). Water quality management plans (or Total Maximum Daily Loads) (TMDLs) are developed and approved by the Environmental Protection Agency, and are incorporated herein by reference.

IV. Description of Action Area, Affected Species, Critical Habitat, Essential Fish Habitat

Affected Species and Presence of Critical Habitat — The following anadromous salmonid Evolutionarily Significant Units and their habitat in the New River watershed have special status under the ESA or are given special management consideration as Forest Service Sensitive species.

Endangered:	None
Threatened:	SONCC coho salmon
Critical Habitat:	SONCC coho salmon
Proposed:	None
Sensitive:	UKT and UTR Chinook salmon and KMP steelhead
Essential Fish Habitat:	SONCC coho salmon; UKT and UTR Chinook salmon

SONCC coho salmon (*Oncorhynchus kisutch*) were listed under the ESA as threatened in 1997 (62 FR 24588; May 6, 1997), reaffirmed as threatened in 2005 (70 FR 37160; June 28, 2005) and 2011 (76 FR 50447; August 15, 2011) and critical habitat was designated in 1999 (64 FR 24049; May 5, 1999). In the assessment area, SONCC coho salmon and their designated critical habitat occur in the New River and its tributaries (refer to the Figure A-4 in Appendix A).

Field surveys, California Department of Fish and Wildlife (CDFW) information and professional judgment of fisheries biologists were compiled into the STNF fish distribution layer in the STNF Geographic Information

Systems electronic library. The distribution of anadromous fish within the project area is shown on the Figure A-4, a map of fish distribution in Appendix A. The distribution of coho salmon and Chinook salmon are over-estimated in this analysis because the distribution of steelhead was used as the basis for analysis of potential effects on all salmonids and their habitat. The distribution of steelhead was also used to determine the extent of critical habitat for SONCC coho salmon, thus the effects analysis contained in this BA/BE represents a conservative approach to analyzing the actual effects of the Project. Table 3 displays the miles of anadromous fish habitat and therefore SONCC coho salmon critical habitat within the Project area by 7th field watershed.

Table 3. Miles of Anadromous Fish Habitat (Critical Habitat) by Subwatershed

7th Field Watersheds	HUC	Miles of Critical Habitat
Eightmile Creek	18010211100101	2.9
Sixmile Creek-Virgin Creek	18010211100102	8.0
Lower Slide Creek	18010211100203	8.7
Twomile Creek-Virgin Creek	18010211100103	9.5
Barron Creek-Caraway Creek	18010211100402	5.0
North Fork Eagle Creek	18010211100201	0.7
Eagle Creek-Slide Creek	18010211100202	6.0
Quinby Creek	18010211100401	0

Biological requirements and life history information for anadromous salmonids potentially affected by the proposed action are described in Appendix F. Conclusions regarding anadromous fish and their habitat (including Critical Habitat) occurrence are based on habitat accessibility and suitability, professional judgment, STNF District fish survey records, and NMFS and California Department of Fish and Wildlifepublic information.

In addition to Critical Habitat designations for SONCC coho salmon, EFH provisions of the Magnuson-Stevens Act (MSA) require heightened consideration of habitat for commercial species in resource management decisions, including EFH for SONCC coho salmon and UKT Chinook salmon. EFH is defined in section 3 of the MSA as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interprets EFH to include aquatic areas and their associated physical, chemical and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem.

The MSA and its implementing regulations at 50 CFR 600.92(j) require that before a federal agency may authorize, fund or carry out any action that may adversely affect EFH, it must consult with NMFS. The purpose of the consultation is to develop conservation recommendations that address reasonably foreseeable adverse effects to EFH. Freshwater EFH for Pacific salmonids includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically, accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and long-standing impassable natural barriers. In the assessment area, EFH for coho and Chinook salmon occur in the New River and its tributaries throughout the range of anadromous fish (refer to Figure A-4 in Appendix A).

This BA's analysis of effects to Pacific salmonid habitat includes, by definition, an analysis of effects to EFH.

V. Existing Environment and Effects on Anadromous Salmonids and Their Habitat Indicators

This section describes existing conditions and provides an analysis of the direct and indirect effects of the Project on listed anadromous fish and their habitat (including Critical Habitat) in the Action Area, at the site-scale and at the 7th- and 5th-field watershed scales. Habitat requirements (expressed by the key Habitat Indicators) are similar for all anadromous salmonids considered in this BA/BE. The analysis of the potential effects on anadromous fish and their habitat is based on the preferred alternative, which is Alternative 3.

The project area is characterized by steep, rugged, largely un-roaded terrain in the Trinity Alps Wilderness. Vegetation in the area is comprised primarily of tree-dominated stands – both conifer and hardwood, which make up about 85% percent of the project area. Dominant vegetation types are Douglas-fir, mixed-conifer, red fir and white fir.

Repeated and recent large wildfires of moderate to high severity have occurred throughout the project area and extended into adjacent areas during the past 20 years. Fire suppression and the Big Bar Complex of 1999 created vegetation and fuels conditions within the project area that are conducive to large fire growth and large areas of high severity fire, the most recent examples of which include the Backbone and Red Spot fires of 2009. Repeated occurrences of recent high severity wildfire within the project area has increased soil erosion and reduced soil productivity. Steep eroding headwalls, active and dormant debris slides, and inner gorges occur throughout the project area.

The project area drainages are located within the New River 5th –field watershed, a tributary to the Trinity River. The New River watershed is identified as a Tier 1 Key Watershed in the Northwest Forest Plan. These watersheds serve as refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species and provide high quality water. Streams within the project area exhibit relatively steep gradient and are primarily sediment transport reaches.

The Trinity River is listed as sediment impaired by the Environmental Protection Agency (EPA) under the Clean Water Act section 303d. A total maximum daily load assessment (TMDL) has been completed. The drainages within the project area are included in the TMDL. A sediment source analysis for the mainstem of the Trinity River has been completed that includes the project area; however, a Trinity River Management Plan has not been completed. Project area drainages are identified as reference (healthy) watersheds within the Trinity TMDL for sediment. Reference watersheds are defined as watersheds that are currently exhibiting high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and exhibit a stable drainage network. Physical and biological conditions suggest that aquatic and riparian systems are predominantly functional in terms of supporting dependent species and beneficial uses of water. Management-induced disturbances have not resulted in significant alteration of geomorphic, hydrologic or biotic processes, nor have concerns for such effects been raised to date.

The analysis of potential effects to anadromous fish and their habitat is organized by direct and indirect effects. Direct effects are those immediate effects of the Project. Indirect effects are those effects that occur later in time or at a different geographical location. Indirect effects mechanisms are, typically, effects to habitat and are assessed herein as effects to key habitat Indicators for anadromous salmonids. The Indicators originate from Appendix A of the Analytical Process, 2004 (*Table of Population and Habitat Indicators)*. The evaluation of habitat Indicators is given below as well as summarized in tables for each subject watershed in Appendix E of this

BA/BE. “Population characteristics” and “Population and habitat” listed in Appendix A of the Analytical Process are not evaluated since these were established for bull trout. The pathways in the Tables are addressed based on the best available information.

The STNF used scientific data, field reviews, and the Cumulative Watershed Effects (CWE) modeling to determine the existing conditions and to estimate potential risk (probability) and magnitude of sediment delivery from surface erosion (using the Universal Soil Loss Equation – USLE), and mass-wasting (using the GEO model component) and flow-related watershed conditions (using the Equivalent Roaded Acre, or ERA model component) in the Action Area (Appendix C). The results of CWE modeling are discussed below under the Sediment/Turbidity/Substrate character, Change in Peak and Base Flow, and Disturbance Indicators.

The final ESA determination for the Project was made after considering the intensity and extent of the proposed activities, the proximity of anadromous fish to proposed activities, and the distribution and life history of anadromous fish in the Action Area. The distribution of salmonid habitat is shown on Figure A-4 in Appendix A.

As described earlier, the Project includes three primary project elements:

- Prescribed Fire Treatments
- Existing Trail and Fireline Maintenance
- Danger (Hazard) Tree Removal

The probability for short- and long-term indirect effects on anadromous fish is associated with direct and indirect effects in the context of existing conditions. Thus, direct and indirect effects are discussed along with existing conditions of key Habitat Indicators.

Efficiency Measures for Analysis

Geographic area refined to reflect the location of proposed actions, potential effects on hydrologic processes, and effects on anadromous salmonids.

Project activities will occur in eight 7th field watersheds that are all within the New River 5th field watershed (Table 1). Proposed actions have the potential to affect anadromous salmonids in all but one of the 7th field watersheds, Quinby Creek. Proposed actions within the Quinby Creek subwatershed include six acres of prescribed fire; five acres in the Barron Creek project area and one acre in the Salmon Summit to Fawn Ridge project area. All proposed burn acres in this subwatershed take place upslope with no actions in riparian reserves. Additionally, the Quinby Creek subwatershed contains neither anadromous fish habitat nor SONCC coho salmon critical habitat.

Because of the lack of anadromous fish habitat, the small amount of acreage (less than 1%) proposed for prescribed fire and no actions in riparian reserves, there is no probability for proposed actions within the Quinby Creek subwatershed to affect anadromous fish or their habitat. Quinby Creek subwatershed will not be discussed further in this document; all other subwatersheds will be analyzed.

Project Elements That Will Have No Effect on Salmonids or Their Habitat in the Action Area

All three project elements (PEs) will be considered in the effects analysis for this project.

Site Scale and 7th- and 5th-Field Watershed Scales Anadromous Fish Habitat Exposure Analysis

Based on consideration of the proposed actions' proximity to anadromous fish and their habitat, along with the probability of direct, indirect and cumulative effects, the area where there is potential for exposure of anadromous fish and/or their habitat within the Action Area is as follows:

> **Site Scale** — Prescribed burning has the potential to impact salmonids and their habitat at the site scale where project areas allow fire to back into riparian reserves.
>
> Existing trail and fireline maintenance and danger tree removal have the potential to impact salmonids and their habitat at the site scale where these activities occur within riparian reserves.
>
> **5th and 7th Field Watershed Scales** — Prescribed burning has the potential to impact salmonids and their habitat at the watershed scale because of risk of increased sediment delivery to anadromous fish streams.
>
> Existing trail and fireline maintenance and danger tree removal pose no risk at the watershed scale because both these actions are extremely limited in scope and do not change existing conditions within the action area.

Habitat Indicators That Will Not Be Affected by Project Elements

As described above, the BA/BE effects analysis uses key indicators of habitat quality (habitat indicators) as identified through the Analytical Process (USDA-USDOC-USDI 2004) to assess effects to anadromous salmonids and their habitat. There are no causal mechanisms for PEs to affect the following habitat Indicators, thus they will not be analyzed further in this BA.

> **Habitat Access: Physical Barriers** — This PE does not occur within stream channels and has no causal mechanism to alter anadromous fish migration or alter fish access by creating or removing physical instream barriers.
>
> **Habitat Elements: Off-Channel Habitat and Channel Condition and Dynamics: Floodplain Connectivity** — Floodplains and off-channel habitat areas are not a significant component in the mountainous, high gradient, transport stream reaches that occur in the analysis area. Proposed actions do not change channel transport capabilities or change the number of road-stream crossings, a primary factor in loss of floodplain connectivity. Project stream channels are naturally entrenched and are not structured to provide off-channel ponds, oxbows, backwaters or significant low energy side channels. PEs have no causal mechanism for excessive channel scour or stream channel downcutting and do not alter stream channel stability, channel shape, erosive energy, or reduce channel roughness through loss of large wood or loss of large size class substrate (cobble or larger).
>
> **Channel Condition and Dynamics: Average Wetted Width/Max Depth Pools and Streambank Condition** — These PEs do not change the functional condition of stream channels and have no causal mechanism to alter channel morphology or streambank stability.
>
> **Flow/Hydrology: Increase in Drainage Network** — This PE does not increase road or trail lengths, add ditches or cause compaction. PEs have no causal mechanism to increase active channel lengths.
>
> **Watershed: Road Density and Location** — These PEs do not increase road or trail densities thus there is no causal mechanism for this indicator.

Analytical Process Effects Determinations

The following section summarizes the current and expected future baseline conditions for each project element in the Trinity Alps Wilderness Prescribed Fire project. Matrix summaries of the existing environmental baseline and effects of Project Elements for each 7th-field sub-watershed within the action area are displayed in Appendix E. Existing conditions and effects have been rated using the matrix criteria in Appendix G. Each of the three project elements is analyzed for its effect on habitat indicators that are used to characterize the health of aquatic habitat. Changes to an indicator are evaluated using factor analysis to determine if there is an effect to individuals of the species or critical habitat.

Summary of Baseline Conditions for Habitat Indicators in the Watershed and Project Area

Existing baseline conditions for the New River watershed have been summarized based on an analysis of watershed indicators (Table 4). Additionally, baseline conditions for project area 7th-field watersheds are also displayed in Tables 5 and 6.

Table 4. Baseline Conditions in the New River 5th-Field Watershed.

Ranking	Properly Functioning	At Risk	Functioning at Unacceptable Risk
Baseline Indicator	Temperature Sediment/Turbidity Chemical/Nutrients Physical Barriers Substrate and Embeddedness Pool Frequency &Quality Large Pools Refugia Width/Depth Ratio Stream Bank Condition Peak/Base Flows Drainage Network Increase Disturbance History Riparian Reserves	Large Woody Debris Off-Channel Habitat Floodplain Connectivity Disturbance Regime	

Table 5. Baseline Conditions in North Fork Eagle Creek, Eagle Creek-Slide Creek, Lower Slide Creek 7th-Field Watersheds.

Ranking	Properly Functioning.	At Risk	Functioning at Unacceptable Risk
Baseline Indicator	Temperature Sediment/Turbidity Chemical/Nutrients Physical Barriers Substrate and Embeddedness Pool Frequency &Quality Large Pools Refugia Width/Depth Ratio Stream Bank Condition Peak/Base Flows Drainage Network Increase Disturbance History Riparian Reserves	Off-Channel Habitat Floodplain Connectivity Disturbance Regime	Large Woody Debris

Table 6. Baseline Conditions in Eightmile Creek, Sixmile Creek-Virgin Creek, Twomile Creek-Virgin Creek, Barron Creek-Caraway Creek, and Quinby Creek 7th-field watersheds.

Ranking	Properly Functioning.	At Risk	Functioning at Unacceptable Risk
Baseline Indicator	Temperature Sediment/Turbidity Chemical/Nutrients Physical Barriers Substrate and Embeddedness Pool Frequency &Quality Large Pools Refugia Width/Depth Ratio Stream Bank Condition Peak/Base Flows Drainage Network Increase Disturbance History Riparian Reserves	Large Woody Debris Off-Channel Habitat Floodplain Connectivity Disturbance Regime	

Summary of the Proximity of Anadromous Fish to the Proposed Action

The proximity to anadromous fish distribution varies by treatment area, and is a common variable discussed throughout the Effects Analysis. Stream distances from anadromous fish distribution to the closest treatment area boundary for each proposed prescribed burning area is displayed in Table 7 along with approximate acres of riparian reserves, calculated using the standards found within Chapter 2 in the Environmental Assessment. All treatment areas except for Salmon Summit to Election Gap and Salmon Summit to Fawn Ridge propose prescribed fire to back into riparian reserve areas adjacent to anadromous habitat.

Table 7. Proximity of Treatment Areas to Anadromous Fish Habitat.

Treatment Area	Acres of Treatment Area	Acres of Treatment Area in Riparian Reserves	Closest Distance of Treatment Area to Anadromous Fish Habitat
Salmon Summit to Election Gap	1,680	212	0.5 miles
Election Gap to New River	1,202	220	Adjacent to Habitat
Salmon Summit to Fawn Ridge	2,020	442	0.75 miles
Megram	9,619	2,676	Adjacent to Habitat
Barron Creek	2,163	499	Adjacent to Habitat
Twomile Ridge	1,091	231	Adjacent to Habitat
Sixmile Ridge	524	86	Adjacent to Habitat
Soldier Ridge	765	140	Adjacent to Habitat

Effects of the Proposed Actions

Direct Effects: The direct or immediate effects of the project on the species or its habitat.

Indirect Effects: Those effects that are caused by or will result from the proposed action and are later in time and possibly off-site, but are still reasonably certain to occur.

Direct Effects

Proximity and Probability: No PE occurs in live streams or in the New River. In order to prevent the possibility of direct harm to all life stages of anadromous fish individuals by crushing, resource protection measures restrict project-related field personnel from entering anadromous waterways from October 15 through April 15. Based on the fact that there are no activities proposed within stream channels that are accessible to anadromous salmonids, the Project will have no direct effects on coho salmon, Chinook salmon, steelhead, or their habitat.

Indirect Effects

The remaining analysis of effects is focused on indirect effects based on the Efficiency Measures described above and is organized by habitat Indicators.

Water Quality: Temperature

Existing Conditions

Streams in the project area are wilderness streams that have had little human disturbance. Although temperature monitoring has not occurred in project area streams, spot temperatures taken in Virgin Creek during the summer of 2011 were 56 degrees F, well below the properly functioning condition threshold of ‘less than 67 degrees F’.

Post-Project Conditions

Prescribed Fire Treatments
Proximity: Low-intensity prescribed fire will be allowed to back downslope into riparian reserves in all project area subwatersheds.

Probability: Effects from low severity backing fire would be negligible because the area affected would be on the outer edge of the riparian buffer, fire severity would be low, and soil cover and canopy cover would be maintained. The effects of prescribed fire on streams and riparian zones were studied by Beche et.al. (2005), by actively lighting fire within riparian zones. Low to moderate severity fire did not measurably change riparian canopy cover and the patchy behavior of prescribed fire along with moisture levels in the riparian zone served as an effective barrier from fire reaching the stream. Implementation of burn prescriptions and resource protection measures will maintain stream and riparian functions and stream shade levels will not be affected by the project, thus water temperature will not be affected.

Increased stream temperature resulting from reduced shade is a concern if high-severity, stand replacing wildfire occurs within riparian reserves. This project is designed to reduce the risk of wildfire damage to both aquatic and terrestrial resources across the landscape. There may be long-term benefit to stream temperature by the proposed project reducing the risk of widespread, high severity wildfire.

The probability of prescribed burning in riparian reserves to increase stream temperatures in anadromous fish habitat is discountable.

Existing Trail and Fireline Maintenance
Proximity and Probability: There is no causal mechanism for this PE to influence stream temperature. Trail and fireline maintenance is confined to existing features on the landscape, most of which are upslope. Some trails may cross stream channels; however, hand brushing and pruning vegetation lining existing trails and fireline will not remove stream shade and thus stream temperature will not be affected by this PE.

Danger Tree Removal
Proximity and Probability: There is no causal mechanism for this PE to influence stream temperature. Danger trees are typically snags that do not provide significant amounts of shade to a stream. In the highly unlikely event a danger tree would be felled within a riparian reserve designation there would be no measureable loss of stream shade and thus no change in water temperature.

Temperature Indicator Summary

The Prescribed Fire Treatment PE has a neutral short term effect and insignificantly positive long term effect. The Existing Trail and Fireline Maintenance and Danger Tree Removal PEs have no causal mechanisms to influence stream temperatures. Combined, these PEs will not change the functioning condition of the temperature indicator and will have no direct or indirect effect on water temperature. The change to baseline is neutral.

Water Quality: Suspended Sediment – Intergravel Dissolved Oxygen/Turbidity, Habitat Element: Substrate Character and Embeddedness

The spawning, sediment and substrate indicators are grouped since they are affected similarly by project elements. Turbidity is an indicator of fine sediment suspended in water; substrate is an indicator of fine sediment that settles on the stream bed. Spawning habitat quality is determined by the availability of gravel-sized substrate and the amount of fine sediment in spawning gravels.

Existing Conditions

The project area consists of steep, rugged terrain susceptible to erosion. Being wilderness, disturbance in project watersheds is primarily natural not human-caused with most of the proposed treatment areas previously burned by wildfire and affected by past floods. The geology of the landscape includes steep eroding headwalls, active and dormant debris slides and steep inner gorges. The Forest Geomorphology layer reveals that active landslides are common between Election Gap and Salmon Mountain along the Trinity/Klamath divide. These are primarily debris slides (shallow, rapidly moving landslides), and many appear to reach to near the ridge crest. Some appear to be associated with the 1964 flood. Drainages with a large number of debris flow tracks include Eagle, Slide, Eightmile, Twomile, and Virgin Creeks. Large recent wildfires, such as the Backbone, Bake Oven, and Megram fires removed a large proportion of the vegetation, and increased the potential for landslides. Most of the calculated maximum erosion hazard ratings (EHR) are predominantly moderate to high. Soils with very high EHR exist in the western third of the Quinby Creek Drainage.

During field visits to Virgin Creek and Slide Creek in summer of 2011 it was determined that the sediment and substrate indicators are properly functioning. The New River watershed and all project subwatersheds are considered properly functioning for sediment in the Trinity TMDL and are used as reference watersheds. The cumulative watershed effects models for existing conditions indicate that all project watersheds are well below the threshold of concern and all have extremely low surface erosion risk ratings. Eightmile Creek, Sixmile Creek-Virgin Creek, North Fork Eagle Creek, and Quinby Creek subwatersheds all have high sediment delivery risks from landslides because of their geology combined with past high-severity fire.

Post Project Conditions

<u>Prescribed Fire Treatments</u>
Proximity: All treatment areas except for Salmon Summit to Election Gap and Salmon Summit to Fawn Ridge propose prescribed fire to back into riparian reserve areas adjacent to anadromous fish habitat. All subwatersheds have proposed prescribed fire backing into riparian reserves adjacent to anadromous fish habitat except for Eightmile Creek.

Probability: The greatest hydrologic influence that prescribed fire has on watershed processes affects infiltration (the amount of water that can move through the soil surface) and overland flow potential (Baker 1990). If more water is supplied than can infiltrate soils the excess runs off as overland flow, which can increase the level of suspended sediment transported in streams. Executed properly, prescribed fire does not significantly alter infiltration rates or overland flow due to the patchiness and lower intensity of vegetation burning and resultant soil effects (Baker 1990).

Precipitation is a major factor influencing post-fire erosion responses, and generally post-fire erosion will be more pronounced in wet years as compared to normal rainfall years (Wohlgemuth 2001). Natural stream sedimentation processes also largely depend upon the intensity of winter storm events and the proximity of sensitive areas to streams.

Small amounts of sediment are expected to reach intermittent and perennial streams within the project area. Because most burn areas are located along ridgetops and occur in upslope areas, sediment reaching stream channels is most likely to be in headwater areas upstream from fish-bearing waters. Additionally, less than 10% of areas burned by proposed prescribed fire are predicted to burn at moderate or high severity. Low severity prescribed fire allows for retention of soil cover which further reduces erosion potential. The prescribed fuel treatment is designed to meet forest soil ground cover requirements in treated areas. Fine sediment exposed by prescribed fire is expected to be washed downslope during the first few post-burn precipitation events large enough to cause runoff from hillslopes. Most fines will settle out in vegetation and duff but some may be delivered to stream channels during storm events. Growth of herbaceous vegetation during the first growing season after prescribed fire treatments will also further reduce the risk of sediment delivery to stream channels. Low severity backing fire will be allowed to enter riparian reserve designations, which is not expected to negatively affect riparian reserve function.

Because fire is a natural watershed disturbance in this area, native species are adapted to persist under the natural fire regimes and associated watershed conditions. Although anadromous fish may be exposed to slight increases in turbidity and fine sediment during storms post-project, there is low probability that the amount generated from project actions would adversely affect patterns of migration, spawning, or rearing.

Magnitude: The CWE analysis report (USDA Forest Service 2012) shows USLE (surface erosion) risk ratio values increase slightly in seven of the eight 7th-field sub-watersheds post-project. The largest increases are 11% in Sixmile Creek-Virgin Creek and 17% in North Fork Eagle Creek. All other subwatersheds have increases of less than 10%. Pre-project and post-project USLE values are extremely low for all watersheds and modeled increases due to the Project do not approach levels that would cause adverse impacts in any watershed. Normal (average severity) rainfall events following prescribed burning activities are expected to slightly increase the sediment yield of the treated watershed during the first year post-burn. Substantial recovery toward existing conditions would occur in year 1 and return to near pre-project levels within 3 years (in the absence of other disturbances) (USDA Forest Service 2012).

GEO risk ratio values are less affected by the project than USLE values and increase by extremely small amounts based on mass wasting modeling. Three of the eight subwatersheds have increases by 2% or less, the other five subwatersheds have no increase in risk. Existing condition (pre-project) landslide risks are moderately high in four subwatersheds (Eightmile Creek, Sixmile Creek-Virgin Creek and North Fork Eagle Creek and Quinby Creek) due to the geomorphology and steep terrain of the area, and the extent and burn intensities of past wildfires. Project mitigation measures to either avoid burning or ensure low severity burns on active slides and slide prone areas would be applied as part of the resource protection measures. Low severity fire is assumed to have no effect on landslide potential because it removes only smaller understory vegetation, and has a negligible effect on root support and slope hydrology. Since proposed prescribed fire treatments are predominantly low severity burning of understory vegetation and forest floor litter, the proposed action is not expected to result in increased mass wasting or debris flow activity above existing rates.

The CWE analysis is not spatially explicit for space and time in that, results assume all proposed activities occur within one year and the effects of proposed actions do not vary with specific locations within a watershed. Prescribed fire activities will be distributed spatially across the project area and will occur over the course of five or more years, depending on the “window of opportunity” to implement desired fire prescriptions. Since the models assume all project areas are fully treated, and all of the project area is treated in the same year, the CWE analysis results provide an over-estimation of post-project cumulative watershed risk. In reality, the effects of project generated erosion on hydrologic resources, water quality, and anadromous fish habitat will vary with the distance of the disturbance to stream courses and will likely be even less than modeled estimates. Impacts and soil disturbance will be minimized at the site scale in project area watersheds such that off-site cumulative watershed effects will be largely eliminated. Post-project cumulative risk ratios for proposed actions are well below levels of concern for all watersheds modeled.

The resource protection measures and Best Management Practices to be implemented for proposed actions are expected to minimize disturbance to hydrologic resources, water quality and anadromous fish habitat in the project area to a negligible level. These features are designed to minimize project-generated erosion and sediment delivery to aquatic habitats, both within and downstream of the project area by:

1. allowing only low severity backing fire to enter riparian reserves.
2. mitigating the effects of existing handlines by water-barring all fire lines and mulching fire lines that do not have more than 35 percent rock fragments with straw or fine slash, and not constructing any new containment lines.
3. limiting the area treated. A maximum of 10% of a given 6th-field watershed can be treated in any one year.
4. preventing moderate and high severity fire in active landslides, active debris slides, and inner gorges.
5. retaining post-treatment soil cover between 50 and 70 percent on metamorphics, and greater than 90 percent on granitics.
6. retaining set amounts of existing down coarse woody debris for protection of soil fertility.
7. retaining 50 percent or more of the existing surface duff mat
8. implementing BMPs to minimize soil disturbance and protect water quality.

Since only low severity prescribed fire treatments will be allowed to back into riparian reserves, these areas will retain their ability to filter excessive sediment and stabilize stream channels post-project. In context of existing instream habitat conditions, sediment and turbidity-related effects of the project will be of low magnitude and of a quantity that could not be meaningfully measured or evaluated. Due to project design, insignificant indirect effects are anticipated to SONCC coho and other anadromous fish species and their habitat (including CH) as a result of suspended sediment and turbidity. Prescribed burning may increase sediment yield in the short-term, however it is expected to have insignificant effects to substrate character and embeddedness. In the long-term, the potential for controlling future higher severity wildfire will be increased; this may have a long-term benefit for spawning habitat, water quality and for anadromous fishwhen comparing the no action alternative.

Existing Trail and Fireline Maintenance

Proximity: Existing trails and existing firelines along with natural topographic features will be used to contain prescribed fire actions. Maintaining these features would mostly occur outside of riparian reserve designations except where trails and firelines cross stream channels. See Project Design Features in the Project Geology/ Hydrology/Soils Report.

Probability: Clearing overgrown vegetation by slashing brush, hand pruning, and moving large downed wood by hand do not pose surface erosion concerns because the small amounts of vegetation moved would not alter soil stability. Waterbarring existing firelines is a resource protection measure included in the proposed action (Project Hydrology Report) to prevent excessive soil erosion during rainfall events and is expected to dissipate run-off and surface fines from mobilizing to a level that could reach a stream channel. It is extremely unlikely maintaining existing trails and fireline (as proposed in the Trinity Alps Wilderness Prescribed Fire project) would increase turbidity and instream fine sediment and thus is discountable.

Danger Tree Removal

Proximity and Probability: Danger trees will be avoided where possible and will only be felled where the tree poses a hazard to fire personnel. It is highly unlikely a danger tree will need to be felled within a riparian reserve designation but if this is necessary, the tree will remain onsite to provide benefits to the riparian zone. The felling of a danger tree in the riparian reserve is not expected to produce measureable amounts of sediment to the stream channel and the functioning of the riparian reserve would be unaffected, including the sediment filtering capacity of duff, down wood and vegetation. Therefore, there is a discountable probability this PE will generate enough sediment to reach a stream channel and there would be no effects to suspended sediment, turbidity, substrate character or embeddedness.

Sediment/Turbidity, Substrate, Embeddedness Indicator Summary

The proposed prescribed burning actions have been designed to minimize the risk of fine sediment delivery to stream channels. There will be slightly negative and short-term effects to the Sediment and Substrate Indicators due to prescribed burning activities. These effects are expected to be limited to the site scale, which should be insignificant where anadromous fish species are found. Existing Trail and Fireline Maintenance and Danger Tree Removal PEs will result in a neutral change to baseline suspended sediment and substrate conditions. All PEs will have corresponding neutral changes to spawning.

When combined, the PEs show minor increases in risk for surface erosion and runoff, and no change for landslide risks. The PEs combined will have insignificantly negative short-term effects, long-term effects will be neutral on the Turbidity and Substrate Indicators, and none will change the functioning condition of the Indicators in any Project subwatershed.

Water Quality: Chemical Contamination/Nutrients

Existing Conditions

There are no known sources of chemical or nutrient pollution in project area subwatersheds. Water chemistry and nutrients were rated as "properly functioning" for the New River watershed and for all subwatersheds in the project area.

Post Project Conditions

All Project Elements are grouped for this factor analysis because there is no discernible difference in their effect on the Chemical Contaminants/Nutrients indicator. The project will not increase chemical or nutrient inputs to the aquatic system because there will be no application of fertilizers or other chemicals, and because fuel handling activities will occur well away from aquatic features and outside of riparian reserves.

Proximity: Areas for fueling helicopters and aerial drip torch systems, and charging plastic sphere dispenser equipment will be located at the main helibase, outside of the project area. Helicopter flight paths will cross over riparian reserves and stream channels. .

Probability: There is a discountable probability for petroleum products from a helicopter or aerial drip torch, or bulk chemicals used in plastic sphere dispenser machines reaching aquatic systems because this would happen only in the case of an aviation accident.

Compounds used in plastic spheres are highly volatile when mixed together and ignite within 20 to 30 seconds of injection, completely consuming the plastic sphere and the chemical. Plastic spheres will be dropped onto ridgetop locations for prescribed fire ignition; they will not be dropped into riparian reserves. During firing operations, it is extremely unlikely for these compounds to enter project area waterways because they are completely consumed by the chemical reaction.

The probability of fuel from hand-held equipment fueling sites reaching aquatic systems is so low as to be discountable due to the distance between fueling sites and streams, and the filtering and absorption that would occur in intervening areas. The potential exists for fire personnel to spill petroleum products into streams when hiking on a trail or fireline that crosses a channel. The probability of this occurring is remote and considered highly unlikely.

Chemical Contamination/Nutrients Indicator Summary

The project will have a neutral effect on chemical contamination/nutrients.

Habitat Elements: Large Woody Debris (LWD)

Existing Conditions

Large wood (LW) was rated as "functioning at risk" for the New River watershed. The abundance of LW falls below expected values of 40 pieces per mile within the action area. Ratings of LW for the Lower Slide Creek subwatershed are "not properly functioning" and are "functioning at risk" for all other subwatersheds. Quantitative data on large woody debris on all streams within the project area is lacking. Future LW recruitment into New River watershed stream channels has been predicted to increase because of the number of wildfires on the landscape (USDA 2000).

Post Project Conditions

Prescribed Fire Treatments
Proximity: Prescribed fire is proposed in riparian reserve designations in all project area subwatersheds.

Probability: Prescribed burn prescriptions are designed to retain large woody debris (> 12 inches in diameter), both standing and downed, in riparian reserves within a range to meet historical levels (prior to suppression era). Low severity fire backing downslope into riparian reserves, will not burn hot enough or long enough to consume existing instream LW and will not reduce future LW recruitment. Prescribed burning in riparian reserves is expected to have discountable effects to LWD.

Treating riparian reserves with prescribed fire may have slight positive long term effects to LWD levels by protecting these areas from burning under high fire severity conditions in the future. High severity wildfire in riparian reserves would have the potential to consume LW and decrease LW recruitment.

Existing Trail and Fireline Maintenance
Proximity and Probability: This PE has no causal mechanism to affect existing levels of LWD or LW recruitment potential. Trail and fireline maintenance is confined to existing features on the landscape, most of

which are upslope. Some trails may cross stream channels; however, hand brushing and pruning vegetation lining existing trails and fireline will not remove LW.

Danger Tree Removal

Proximity and Probability: In the unlikely event a danger tree will need to be felled within a riparian reserve designation, the tree will remain onsite to provide benefits to the riparian zone. Danger tree removal will not remove LW from project area stream channels nor decrease future LW recruitment. This PE is expected to have discountable effects to LWD.

Large Woody Debris Indicator Summary

The collective PEs will have a neutral effect on LWD. Prescribed burning in riparian reserves is expected to have negligible positive long term benefits to LW by reducing the burn intensity of riparian reserves under future wildfire scenarios and by creating more defensible firefighting conditions in riparian reserves.

Habitat Elements: Pool Frequency and Quality Large Pools, and Refugia

Existing Conditions

All project watersheds were determined to have "properly functioning" pool frequencies, pool quality and large pools. The refugia indicator was rated as "properly functioning" for the New River watershed and all subwatersheds in the project area. The Aquatic Conservation Strategy (ACS) of the Northwest Forest Plan (USDA and USDI 1994) identified "Key Watersheds" throughout the range of the Northern Spotted Owl. Tier 1 Key Watersheds are intended to provide refugia that are crucial to at-risk fish species and stocks and provide high quality water. The New River watershed is considered a Tier 1 Key Watershed in the ACS, providing high quality refugia and supporting a stable population of salmonids.

The principal factors influencing instream habitat conditions including pool frequency, pool quality, large pools, rearing habitat, and refugia include sediment delivery and flow deflectors (such as boulders or large woody debris) serving as pool scouring and channel maintenance agents. The Prescribed Burning PE, which may influence sediment delivery, may impact these instream habitat indicators. The other two PEs are expected to have a neutral effect to pool frequency, pool quality, large pools, rearing habitat, and refugia because of their neutral change to baseline suspended sediment and substrate conditions (see Sediment and Substrate Indicators discussion) and their neutral change to baseline large woody debris (see Large Woody Debris Indicator discussion).

Post Project Conditions

Prescribed Fire Treatments

Proximity: All treatment areas except for Salmon Summit to Election Gap and Salmon Summit to Fawn Ridge propose prescribed fire to back into riparian reserve areas adjacent to anadromous fish habitat. All subwatersheds have proposed prescribed fire backing into riparian reserves adjacent to anadromous fish habitat except for Eightmile Creek.

Probability: Prescribed burning will result in slight increases of soil disturbance and surface erosion at the site scale during storm events following proposed activities. The extent of soil cover loss is expected to be minimized by resource protection measures and Best Management Practices incorporated into the project design. Because of high stream gradients and transport reaches in project area subwatersheds, it is unlikely that streams in these drainages will show any impacts to pool frequency, pool quality, the number of large pools and thus rearing habitat and refugia due to the project. The small amounts of fine sediment that may enter stream channels will likely stay suspended and be transported immediately downstream. Since Project implementation will be distributed spatially and temporally, watershed effects will not occur throughout the project area simultaneously and there is low probability that anadromous fish pool habitat, rearing habitat and refugia will be adversely affected by the project.

Magnitude: In context of existing watershed conditions and anadromous fish life history, the magnitude of probable sediment impacts due to the project is small. The amount of fine sediment generated by prescribed burning and entrained into the stream system is expected to be minor and dispersed and undetectable from existing levels of instream fines. The small magnitude of these impacts will not affect pool frequency, pool quality, or anadromous fish rearing habitat or refugia. Any changes in the sediment regime due to prescribed burning activities are not expected to result in meaningful or detectable effects to pool habitats. Effects are expected to be insignificant at both the site and watershed scales.

Should a wildfire occur in the future, the proposed underburning may have a long term beneficial effect on watershed processes (including hydrological processes and sediment regimes) and fish habitat as it will reduce the severity of effects of a future wildfire.

Pool Frequency and Quality Large Pool and Refugia Indicators Summary

Collectively the PEs are expected to have a neutral effect on Pool Frequency, Pool Quality, occurrence of Large Pools and Rearing habitat. This determination is a result of the stream transport capability, resource protection measures incorporated into the project design and implementation of BMPs.

Flow/Hydrology: Change in Peak/Base Flows

Existing Conditions

Large winter storms with duration of 1-3 days have the greatest potential to cause peak flows in the Coastal Ranges of Northern California. Much of the area previously burned by wildfire within the New River watershed is located between 3,000 – 5,000 feet in elevation. These elevations are vulnerable to rain-on-snow events, which have been responsible for many of the large floods that have occurred in the coastal mountains during the past 100 years. The New River WA (USDA 2000) modeled peak flows using rainfall depth-duration frequencies based on 39 years of rainfall data collected at Hoopa (California Department of Water Resources, 1982). A 10-year recurrence interval storm with 24-hour duration was used for the Big Bar wildfire complex. The results showed about a five percent increase in both 2 year and 10 year interval storm flows due to the effects of wildfire in the New River watershed. The WA concluded this level of flow increase is less than the inter-annual flow variation and is not likely to affect stream channel stability or the populations of aquatic organisms in the stream system of the watershed. Peak/base flows were determined to be “properly functioning” for the New River watershed and for all project area subwatersheds.

Post Project Conditions

Prescribed Fire Treatments

Proximity: Prescribed fire treatments with the potential to remove hillslope vegetative cover are proposed in all project area subwatersheds.

Probability: Flow responses downstream of wildfire areas that would burn at moderate to high severities, often last only a few years and sometimes only the first runoff season. Flow effects resulting from lower severity prescribed burning, which is proposed for this project, are difficult if not impossible to detect (Baker 1990). With predominantly low severity prescribed fire there will not be enough of a decrease in vegetative cover to cause measurable changes to peak/base flows. Excessive surface runoff is not expected, and there will be adequate residual trees and vegetation to provide root strength and to use excess groundwater so that soil stability is largely maintained. In addition, project design criteria are expected to be effective in minimizing effects to the hydrologic function of project area subwatersheds.

The cumulative watershed effects were modeled for the Trinity Alps Wilderness Prescribed Fire project using three models: surface erosion, mass wasting erosion and overall watershed condition (ERA model). All subwatersheds are below thresholds of concerns for cumulative watershed effects. The ERA model is used to estimate the current sensitivity of Project drainages, and shows the likelihood that changes to flows would occur post-project. ERA values for all 7^{th}-field sub-watersheds are well below the threshold of concern value of 1.0, with most drainages having post-project ERA values below 0.50. These values show a discountable probability that flows would be measurably affected by the project (USDA Forest Service 2012). Project actions are not likely to change the runoff response in project area watersheds and are not expected to increase peak/base flows by a detectable level. See Project Geology/Hydrology/Soils Report.

The total area where prescribed fire may burn at moderate to high severity or the area where these actions may create impermeable surfaces or hydrophobic soils is minor. The magnitude of vegetation and ground cover removal proposed by prescribed burning actions is not expected to increase surface runoff. The level of hillslope disturbance caused by proposed prescribed burning has a discountable probability of increasing overall run-off or the timing of run-off at the sub-watershed and watershed scales. See Project Hydrology/Geology/Soils Report.

Existing Trail and Fireline Maintenance and Danger Tree Removal

These two PEs are grouped for this factor analysis because there is no discernible difference in their effect on the Peak Base Flow indicator.

Proximity and Probability: Trail and fireline maintenance and danger tree removal have the potential to occur throughout the project area. These PEs remove very small amounts of vegetation from the immediate site and do not cause ground compaction or impervious surfaces. Waterbarring existing trails and firelines removes the potential for these features to be hydrologically connected to streams. The extremely small levels of disturbance associated with these PEs have no probability of increasing overall run-off or the timing of run-off at the subwatershed at watershed scales and will not influence flow magnitude or timing.

Change in Peak/Base Flows Indicator Summary

The effects of all PEs combined on peak base flows will be insignificant and will have a neutral effect on the peak base flow indicator.

Watershed Conditions: Disturbance History

Existing Conditions

An Equivalent Roaded Area (ERA) model was run for the Trinity Alps Wilderness Prescribed Fire project. The ERA model tracks disturbances that affect watershed processes and provides an indicator of watershed condition.

The model compares the current and proposed level of disturbance within project area subwatersheds as additive ERA coefficients, with a theoretical maximum disturbance level (TOC) developed by the Shasta-Trinity National Forest. The TOC – or threshold of concern – is based on watershed sensitivity and is calculated using soil erodibility, slope, mass wasting potential and 25-year peak flow.

The existing condition results of the ERA model indicate that all drainages are below the threshold of concern value of 1.0 for cumulative watershed effects, thus overall watershed function in the project area has not been affected to a significant degree by past or present land disturbances. Five subwatersheds have values below 0.5; Eightmile Creek, Sixmile Creek-Virgin Creek, and North Fork Eagle Creek have values that range from 0.54 to 0.60. Since most subwatersheds occur in the wilderness, nearly all existing modeled disturbance results are from wildfire. Quinby Creek and Barron Creek-Caraway Creek include other disturbance such as roads. Additionally, project area subwatersheds have greater than 15% late successional habitat.

Disturbance history was determined to be "properly functioning" for the New River watershed and for all project area subwatersheds.

Post Project Conditions

Prescribed Fire Treatments

Proximity and Probability: Prescribed burning activities slightly increase cumulative watershed risk relative to existing conditions but values remain well below 1.0 for all subwatersheds in the project area. Modeled ERA risk ratio increases range from 0% in Quinby Creek subwatershed to 9.0% in Barron Creek-Caraway Creek, Sixmile Creek-Virgin Creek and North Fork Eagle Creek subwatersheds. These increases are negligible. The slightly elevated surface erosion levels resulting from prescribed fire activities are expected to return to near pre-project levels within three years. The prescribed burning PE is likely to result in minor, short-term sediment effects that are within the natural range of watershed conditions in the project area, and is likely to result in reduction of future wildfire resource impacts.

As discussed under the Suspended Sediment, Substrate, and Embeddedness indicators, the CWE analysis assumes all proposed activities occur within one year and the effects of proposed actions do not vary with specific locations within a watershed. Prescribed fire activities will be distributed spatially across the project area and will occur over the course of five or more years. Since the models assume all project areas are fully treated, and all of the project area is treated in the same year, the CWE analysis results provide an over-estimation of post-project cumulative watershed risk. The resource protection measures (including Best Management Practices) that are incorporated into the project design are expected to minimize disturbance to watershed processes including hydrologic resources and water quality to a negligible level. Impacts and soil disturbance will be minimized at the site scale in project area watersheds such that off-site cumulative watershed effects will be largely eliminated.

The disturbance history indicator will be unaffected by this project. As shown in the ERA modeling, the amount of disturbance from prescribed fire is not expected to push overall disturbance levels to thresholds where adverse watershed effects are expected to occur (see the project Hydrology Report). The project would have a neutral effect to the condition rating in the environmental baseline effects to disturbance history.

Existing Trail and Fireline Maintenance, Danger Tree Removal

These two PEs are grouped for this factor analysis because there is no discernible difference in their effect on the Disturbance History indicator.

Proximity and Probability: Existing trail and fireline maintenance and danger tree removal were not included in the ERA model because the effects of these actions are so minor at the watershed scale they do not change the results of the cumulative watershed effects analysis. These two PEs have no causal mechanism for influencing the Disturbance History indicator.

Watershed Conditions: Riparian Reserves

Existing Conditions

Most channels within the New River watersheds had surveys performed in the 1970s and 1980s. Visual observations recorded by surveyors indicated that most channels had intact and properly functioning riparian areas (USDA 2000). Additionally, Stream Condition Inventories were completed within the analysis area in summer of 2011 as discussed below.

Burn severity from the Megram and Onion wildfires in 1999 was mapped and analyzed in the New River WA (USDA, 2000) and applied to interim riparian reserve designations through GIS. Based on these data riparian reserves within the upper New River (within the project area) had about 46% of acres burned by moderate to high severity fire. Site visits to the area at the time suggest that burn severities were over-estimated for many channels, especially smaller channels that were difficult to delineate in a mapping exercise, and riparian areas were lumped into burn classes of surrounding areas. Conclusions about riparian reserve conditions in the New River WA summarized the following: the wildfires had little effect on the physical integrity of the aquatic system; the wildfires had little effect on riparian reserve spatial and temporal connectivity within the New River watershed; network connections remain physically and chemically unobstructed; the wildfires should have little future effects on populations of native plant, invertebrate, and vertebrate riparian-dependent species at the watershed scale (USDA 2000).

During field visits to Virgin Creek and Slide Creek in summer of 2011 it was determined there was 70% or better stream shade in both drainages and riparian reserves were determined to be properly functioning. Combining all the above information, the riparian reserves- Habitat Indicator was determined to be “properly functioning” for the New River watershed and for all project area subwatersheds.

Post Project Conditions

Prescribed Fire Treatments
Proximity: Prescribed fire is proposed to back into riparian reserve designations within all project area subwatersheds.

Probability: The project proposes only low severity backing fire to enter riparian reserves. Significant levels of live vegetation and larger sized dead vegetation in riparian reserves are not expected to be consumed because live and dead fuel moisture is higher adjacent to streams. The steep draws typical of the project area also have higher humidity and lower exposure to direct sunlight due to shading from topographic features and vegetation. Due to the low intensity of fire allowed to back into riparian areas there will be no effect to thermal regulation, nutrient filtering, surface erosion, bank erosion, and channel migration, or large woody debris as the integrity of riparian buffer areas would be maintained and project action will not alter any riparian functions. The project will have no detectable change in water quality, relative to existing conditions (see Sediment, Turbidity, Substrate, Embeddedness effects discussion).

Prescribed fire treatment in riparian reserves is expected to minimize the risk of future extreme fire behavior in riparian habitats. Due to resource protection measures and implementation of BMPs, the integrity of riparian areas and stream channels will be protected from adverse direct and indirect effects of proposed actions. There is a discountable probability that the project will lead to adverse impacts to riparian reserves and high probability that the project will reduce potential future impacts to riparian reserves from wildfires.

Existing Trail and Fireline Maintenance and Danger Tree Removal

These two PEs are grouped for this factor analysis because there is no discernable difference in their effect on the Riparian Reserve indicator.

Proximity: Existing trails and existing firelines along with natural topographic features will be used to contain prescribed fire actions. Maintaining these features would mostly occur outside of riparian reserve designations except where trails and firelines cross stream channels (there are 21 perennial, 19 intermittent, and 40 ephemeral stream crossings within the project area. See Project Hydrology/Geology/Soils Report). Danger trees may be felled throughout the project area.

Probability: These PEs may have some very localized and minor influences but do not change or influence existing conditions in riparian reserves on a subwatershed or watershed scale. Trail and fireline maintenance consists of hand brushing and pruning actions along existing features that may cross riparian reserves. These actions will not change the width or length of trails and firelines that may already exist in riparian reserve designations, nor will they affect existing LWD or trees that could potentially become LWD in the future. The integrity of riparian buffer areas will be maintained along with key functions of riparian reserves.

Danger trees will be avoided where possible and will only be felled where the tree poses a hazard to fire personnel. It is highly unlikely a danger tree will need to be felled within a riparian reserve designation but if this is necessary, the tree will remain onsite to provide benefits to the functioning of the riparian zone.

Maintaining existing trail and firelines and the felling of a danger tree in the riparian reserve is not expected to impact the integrity of the riparian buffer. There would be no effects to riparian function including sediment filtering capacity, thermal regulation (shade), habitat connectivity, nutrient filtering, bank erosion, large woody debris, or existing refugia. Thus, there is a discountable probability these PEs will effect riparian reserves.

Riparian Reserve Indicator Summary

The collective PEs will have a neutral effect on riparian reserves. Prescribed fire treatment in riparian reserves is expected to minimize the risk of future extreme fire behavior in riparian habitats. The scale and intensity of PEs within riparian reserves is small enough that there would be no change to the condition rating for this indicator in the environmental baseline.

Watershed Conditions: Disturbance Regime

Existing Conditions

The drainages contained by the project area are in or near the Trinity Alps Wilderness and are largely unroaded. Hiking and stock trails in the wilderness may cause localized impacts to soil and water resources but have little effect at the watershed scale. Impacts from existing and historical recreation, mining, grazing, and hunting are also limited in extent. The primary disturbance to watershed conditions within the project area is from the effects of wildfire and wildfire suppression tactics. Wildfire is a natural process within the project area; however, repeated wildfire, particularly with large areas of moderate and high severity, has decreased the resiliency of project area subwatersheds to respond to environmental disturbances.

The number of fire occurrences in the project area was measured by the departure from historic fire return intervals. Approximately 91 percent of the project area has missed at least three fire intervals, with some areas having missed as many as six intervals. Fire suppression policies in the project area have created denser multi-storied stands in a landscape that historically had more open stands. Surface fuels and ladder fuels have increased in the absence of naturally occurring low-intensity wildfire that would have occurred historically.

Because of the increased occurrence, large extent and high severity of more recent wildfires in the project area, the disturbance regime indicator was determined to be "functioning at risk" for the New River watershed and all project area subwatersheds.

Post Project Conditions

Prescribed Fire Treatments

Proximity and Probability: Over the past 15 years, wildland fires and associated suppression efforts have created a large amount of fuels, both standing and down. This accumulation increases the potential of high-severity re-burn within the project area. Climate modeling also predicts weather conditions that will likely increase the likelihood of large fire occurrence.

Conducting prescribed fire operations as proposed would begin the restoration of fire to the ecosystem in a controlled manner and promote return to the historic fire regime. Post-project future wildfires would exhibit reduced fire behavior, reduced intensities, reduced severity and would be easier to control and manage in areas where treatment has occurred. As a result, there would be a gradual reduction in accumulated fuels across the landscape and a trend toward historic fuel conditions and a reduced risk of adverse effects to watershed resources.

The project would have a slightly positive effect to the condition rating in the environmental baseline effects to the disturbance regime because proposed actions would begin to bring the disturbance regime back to desired conditions.

Existing Trail and Fireline Maintenance and Danger Tree Removal

Proximity and Probability: Due to the extremely limited extent of trail and fireline maintenance and danger tree removal as proposed, and their potential for only very minor and localized impacts, there is no probability for these two PEs to influence the disturbance regimes of project area watersheds at either the 7th field or 5th field levels.

VI. Cumulative Effects — Endangered Species Act

The ESA defines cumulative effects in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation."

The project area includes two small parcels of private land both are surrounded by National Forest System lands. Almost all stream miles in the project area are within federal lands. Reasonably foreseeable future actions on private lands within the project area include those typical of rural homesites. There are no significant or large scale land management actions on private lands in the project area.

The project CWE analysis examines cumulative watershed disturbance including disturbance from activities on private lands. Results of the CWE analysis (see Project Hydrology/Geology/Soils Report) show slight increases in surface erosion risk with substantial recovery within one year post treatment, and negligible increases in both mass wasting potential and overall disturbance levels. The Project Elements would not contribute cumulatively to other effects because effects would be minor, dispersed, and of relatively short duration and, therefore, insignificantly negative at the site scale 7^{th} field watershed scale and 5^{th} field watershed scales. Prescribed fire treatments are expected to improve watershed conditions in the long term.

VII. Cumulative Effects — National Environmental Policy Act

Cumulative effects under NEPA include Federal or non-Federal activities not yet undertaken, for which there are existing decisions, funding, or identified proposals.

Reasonably foreseeable future and ongoing federal actions that should be included in the cumulative effects analysis for the project include hiking/backpacking, recreational pack stock grazing, and appropriate responses for fire suppression. There are no other projects planned or proposed within the project area.

The potential for the Trinity Alps Wilderness Prescribed Fire project to contribute to cumulative effects is considered low, as the duration of potential effects, in particular sedimentation, to instream and riparian habitat is expected to be short-term and discountable. The eight 7^{th} field watersheds within the project area have either minor or no increases in risk ratios due to proposed prescribed fire, and values remain well below threshold (Refer to Appendix C for tabular results of the CWE analysis). The minor increase is expected to be short-term until vegetative recovery occurs. Further, prescribed burning will reduce the severity of effects of a future wildfire, should it occur, and future cumulative effects from fires in these watersheds.

VIII. Viability of Sensitive Fish Species

Implementation of the STNF LRMP Standards and Guidelines, which are designed to reverse the trend of habitat degradation, as well as address long-term persistence of late-successional-dependent species, would primarily contribute towards species viability in the action area. Overall, implementation of the project would help maintain the health of forested ecosystems by increasing watershed health and thereby reducing the risk of sedimentation into stream channels, lowering the risk of watershed impacts associated with stand-replacing fire including surface erosion, landsliding, loss of riparian vegetation, channel sedimentation, and altered flow regimes.

The project design standards and incorporated resource protection measures would minimize or prevent adverse effects on anadromous salmonids and their habitat at the site scale and minimize effects on these species downstream at the 7th- and 5th-field watershed scales and in the New River. A trend towards listing under the ESA is not anticipated, and viability is not at risk relative to this project because short-term effects on aquatic habitat would be insignificant, the project meets LRMP Standards and Guidelines, and the project would not negatively affect anadromous fish habitat in the long term.

IX. Project Elements and Effects Summary

The Project Elements and associated effects are summarized in Table 7.

Table 7. Summary of effects for the Trinity Alps Wilderness Prescribed Fire Project on anadromous fish and their habitat.

Indicator	Prescribed Fire Treatments	Existing Trail and Fireline Maintenance	Danger Tree Removal
Temperature	0	0	0
Suspended Sediment / Turbidity	-/+	0	0
Chemical Contamination / Nutrients	0	0	0
Physical Barriers	0	0	0
Substrates / Embeddedness	-/+	0	0
Large Woody Debris	0	0	0
Pool Frequency and Quality	0	0	0
Large Pools	0	0	0
Off-channel Habitat	0	0	0
Refugia	0	0	0
Average Wetted Width / Maximum Depth pools	0	0	0
Streambank Condition	0	0	0
Floodplain Connectivity	0	0	0
Peak/Base Flows	0	0	0

Indicator	Prescribed Fire Treatments	Existing Trail and Fireline Maintenance	Danger Tree Removal
Drainage Network	0	0	0
Road Density/Location	0	0	0
Disturbance History	0	0	0
Riparian Reserves	0	0	0
Notes: - Insignificantly negative effect 0 Neutral effect + Long-term positive effect -/+ insignificant short-term negative effect followed by long-term positive effect			

X. ESA Effects Determination

The analysis in Section V determined that the Project Elements of the Trinity Alps Wilderness Prescribed Fire project would have neutral or slightly positive effect on the following indicators at both the site scale and 7th field watershed scales: Temperature, Chemical Contamination/Nutrients, Physical Barriers, Large Woody Debris, Pool Frequency and Quality, Large Pools, Off Channel Habitat, Refugia, Width/Depth Ratio, Streambank Condition, Floodplain Connectivity, Change in Peak/Base Flows, Increase in Drainage Network, Road Density and Location, Disturbance History, Riparian Reserves, and Disturbance Regime, The Trinity Alps Wilderness Prescribed Fire project has a Neutral influence on essential features of Critical Habitat rearing and migration.

The analysis determined that there would be a short-term, slightly negative effect to the Suspended Sediment, Turbidity and Substrate Character and Embeddedness indicators. This is due to the possibility of minimal amounts of fine sediment delivery to streams near or upstream from Critical Habitat resulting from prescribed burning.

The vast majority of fine sediment is expected to be captured prior to entering anadromous fish-bearing portions of streams. Therefore, negative effects are expected to be of low intensity and low duration, minimized by a lack of proximal activities. If fine sediment were ever to route its way to anadromous fish habitat, it would likely occur during the first large precipitation event post-project and not adversely affect stream or fish habitat vs. causing at most short-term turbidity. A very minimal amount of fine sediment is predicted to be delivered to downstream habitat where ESA-listed fish species and their critical habitat are found. The effects to Southern Oregon Northern California Coast coho salmon habitat are expected to be insignificant. Over the long term there would be a positive trend toward improved watershed conditions due to progress towards more historic fire regimes, a reduction of accumulated fuels across the landscape, and a reduction in potential future wildfire severity.

The analysis determined that the effects of the proposed action to the indicators and essential features are either:

a) Neutral;

b) Negative in the short-term due to insignificant, immeasurable effects to the Critical Habitat of Southern Oregon Northern California Coasts coho salmon ESU in the New River watershed and long-term positive effects to these fish; and

c) There are no direct effects to individuals of the listed and proposed fish species and their critical habitat.

An Effects Determination Key was completed for the Trinity Alps Wilderness Prescribed Fire project for federally listed fish species and their Critical Habitat as shown below in Table 8.

Table 8. Effects Determination Summary of Trinity Alps Wilderness Prescribed Fire Project.

Effects Determination Variables	Conclusion (Yes/No)
Do any of the indicator summaries have a positive (+) or negative (-) conclusion?	Yes
Are the indicator summary results only positive?	No
If any of the indicator summary results are negative, are the effects insignificant or discountable?	Yes

Consequently, the effects determination for the Trinity Alps Wilderness Prescribed Fire project is "**may affect, but is not likely to adversely affect**" (NLAA) Southern Oregon and Northern California Coast coho salmon and designated Critical Habitat for SONCC coho salmon. Project design criteria and analysis that contribute to the NLAA effect determination are summarized below:

- Wildfire is a natural watershed disturbance in the project area. Consideration of the natural fire regime indicates that wildfire is likely in the near future. Continued unmanaged wildfire in the project area is likely to threaten watershed resources. Prescribed fire treatments are expected to help protect aquatic ecosystems from potentially severe effects of future wildfire.
- SONCC coho salmon have evolved in the context of natural fire regimes and associated watershed conditions.
- There will be no direct impacts to SONCC coho salmon.
- Only low severity backing prescribed fire will enter riparian reserves. Riparian reserves will remain functional, and stream shade will not be reduced due to the project.
- Resources Protection Measures incorporated into the project design will minimize sediment delivery into streams.
- The project is expected to cause short-term low magnitude increases in stream sediment during high flow events for up to 3 years following prescribed burning but should actually begin to taper off rapidly after the first one or two large storms of the fall or winter after project implementation. These levels are discountable and are not expected to adversely affect SONCC coho ability to spawn, forage or rear in the project area.
- Because the project will be implemented up to a 10 year period and the proportion of any 6^{th}-field watershed treated with prescribed fire is limited to no more than 10% per year, associated watershed effects will be distributed over space and time.

XI. Essential Fish Habitat Assessment

A fish distribution GIS map was provided by the STNF and was used to analyze effects on anadromous salmonid habitat and to identify critical habitat for SONCC coho salmon and EFH for Chinook and coho salmon within the project area (see Figure A-4 in Appendix A). The STNF fish distribution map includes all streams that are used by steelhead, coho salmon, and Chinook salmon. The STNF and this analysis used the fish distribution map to identify Critical Habitat for SONCC coho salmon and Chinook and coho salmon EFH since it is the most complete and conservative information relative to estimating the extent of anadromous salmonid habitat. The effects analysis in this BA/BE considers effects on Pacific salmonid habitat in general, and since habitat requirements and effects mechanisms for coho and Chinook salmon are similar, the effects of the Project analyzed previously are identical for EFH. Therefore, it is my determination that the Trinity Alps Wilderness Prescribed Fire Project will not adversely affect coho salmon and Chinook salmon EFH.

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APPENDIX A — Project Maps

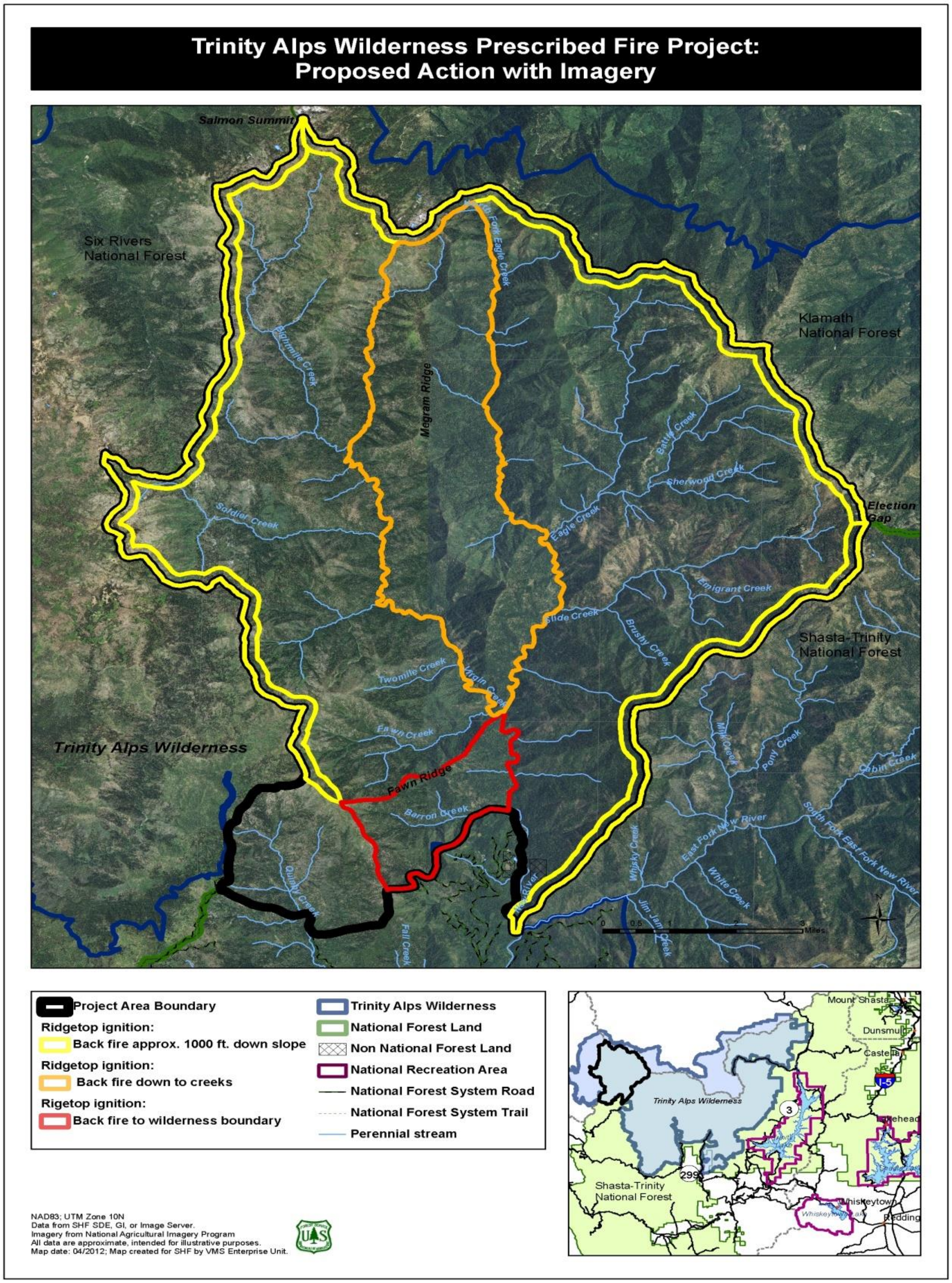

Figure A-1. Trinity Alps Wilderness Prescribed Fire Project — Alternative 2.

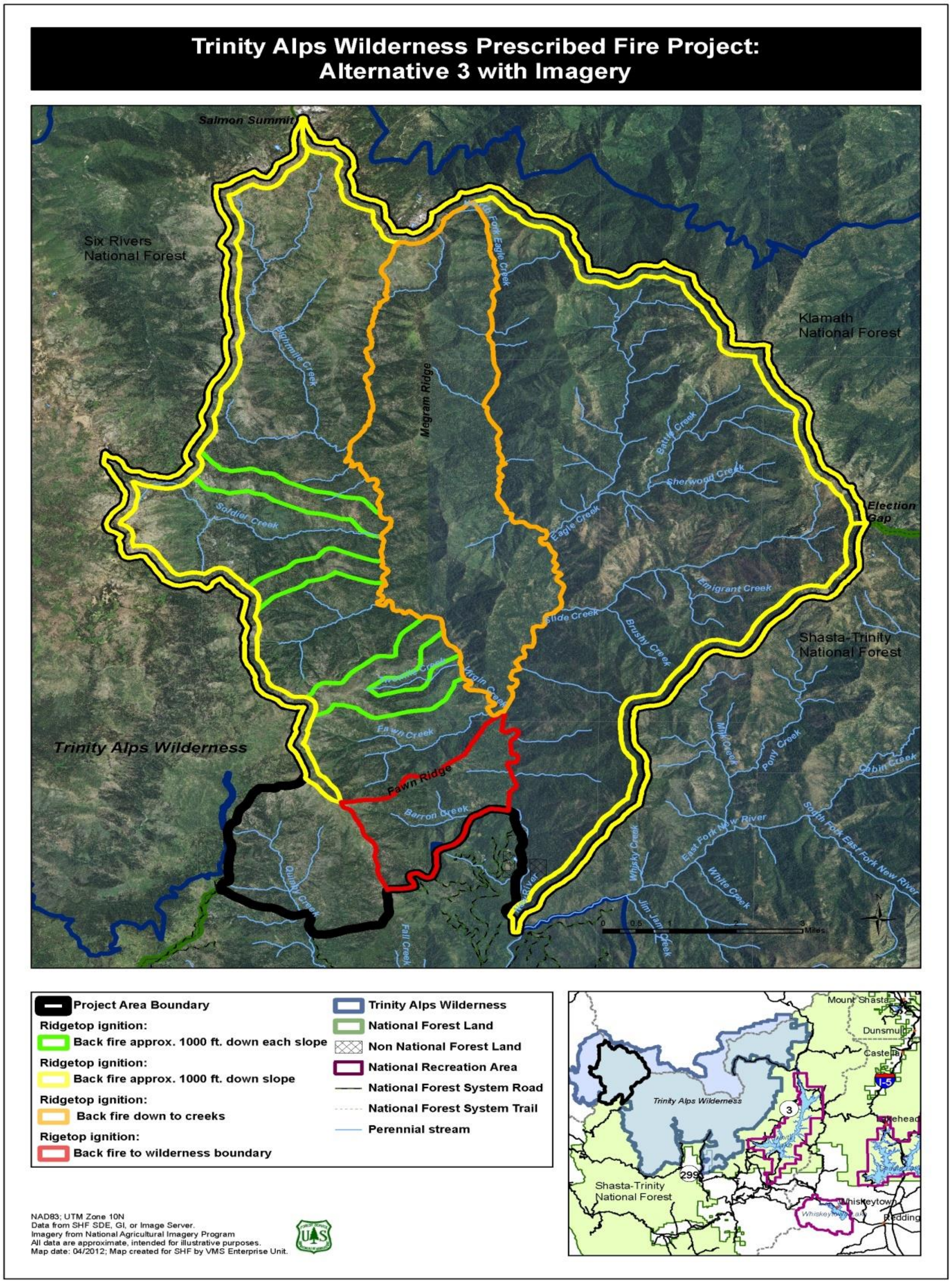

Figure A-2. Trinity Alps Wilderness Prescribed Fire Project — Alternative 3.

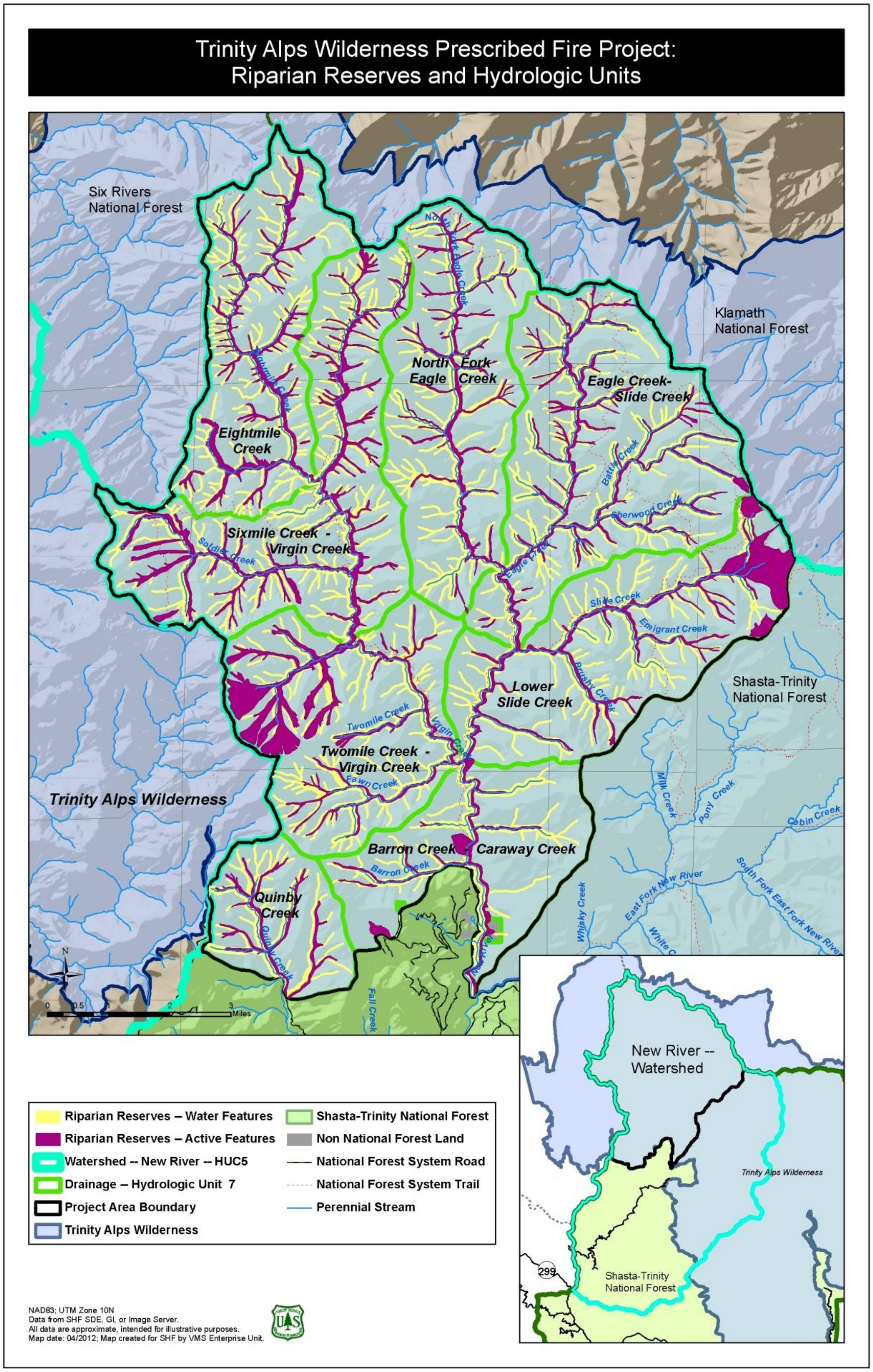

Figure A-3. Trinity Alps Wilderness Prescribed Fire Project — Riparian Reserve and HUC Designations

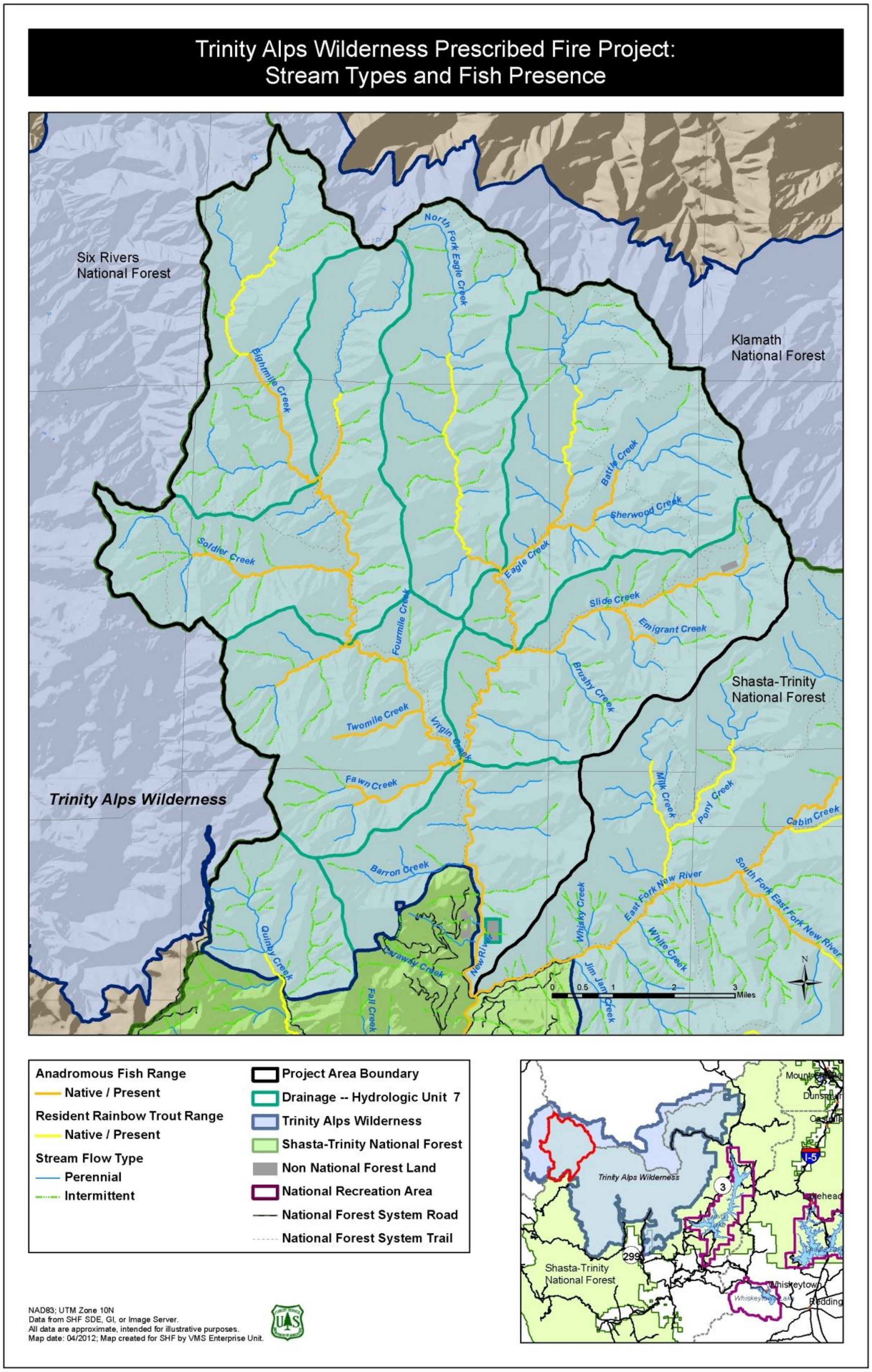

Figure A-4. Trinity Alps Wilderness Prescribed Fire Project – Fish Species Range

APPENDIX B — Resource Protection Measures & BMPs

RESOURCE PROTECTION MEASURES

See Chapter 2 in the Environmental Assessment for a list of all resource protection measures that have been included in the Proposed Action to avoid or minimize impacts on SONCC coho salmon and their critical habitat, and EFH in the short and long term, as well as other sensitive resources.

Best Management Practices

Best Management Practices (BMPs) were developed to comply with Section 208 of the Clean Water Act. BMPs have been certified by the State Water Quality Resources Control Board and approved by the Environmental Protection Agency (EPA) as the most effective way of protecting water quality from impacts stemming from non-point sources of pollution. These practices have been applied to forest activities and have been found to be effective in protecting water quality on the Shasta-Trinity NF. Specifically, effective application of the US Forest Service Region 5 BMPs has been found to maintain water quality that is in conformance with the Water Quality Objectives in the North Coast Regional Water Quality Control Board's (NCRWQCB) Basin Plan.

Forest Service Region 5 BMPs have been monitored and modified since their original implementation in 1979 to make them more effective. Numerous on-site evaluations by the NCRWQCB have found the practices to be effective in maintaining water quality and protecting beneficial uses. The Forest monitors the implementation and effectiveness of BMPs on randomly selected projects each year. Implementation of BMPs occurred on an average of 85 percent of sites in 2006 through 2010. BMP effectiveness requirements were met on an average of 95 percent of the sites sampled in 2006-2010.(USDA 2013*).

The following list of BMPs would be implemented as part of either action alternative. A description of the objective of each BMP is included, as well as how each practice would be specifically implemented. For additional information on the BMPs and their objectives, see the Water Quality Management for Forest System Lands in California – Best Management Practices: Soil and Water Conservation Handbook (USDA Forest Service 2011).

BMP 1.3 – Use of Erosion Hazard Rating for Unit Design

The objective is to identify high or very high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality impacts. Post-burn soil cover would be evaluated by the soil scientist so that fuel management options can be adjusted to minimize soil erosion.

BMP 2.12 – Servicing and Refueling of Equipment

All fueling will be conducted in a designated area, typically on trails or existing firelines. Equipment will have ongoing inspections for fuel leaks. Absorbent material will be used on all drips. All contaminates (including soil) will be taken off site in the event of leaks or spills.

BMP 2.21 – Water Source Development Consistent with Water Quality Protection

There will be no water source development within the project area. Prescribed fire will be controlled by natural topographic features, existing trails and firelines, and fire hand crews.

BMP 6.1 – Fire and Fuel Management Activities

Fuel management projects would have management requirements, mitigation measures, and multiple resource protection prescriptions documented in the project planning and decision documents.

BMP 6.2 – Consideration of Water Quality in Formulating Fire Prescriptions

Water quality will be maintained by implementing the Project in stages over several years, limiting the amount of affected area at any one time, and including resource protection measures for project implementation in riparian reserves. Due to Project design, the integrity and function of riparian ecosystems will be maintained post-project. Water quality and aquatic habitat will be protected long-term because the project is likely to reduce the intensity and extent of future wildfires in the project area.

BMP 6.3 – Protection of Water Quality from Prescribed Burning Effects

This BMP is designed to maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies. Streamside management zones would be identified as part of the burn plan.

BMP 7.8 – Cumulative Off-Site Watershed Effects

Cumulative Watershed Effects models (CWE models) that have been established for use in Region 5 of the Forest Service, and calibrated for use on the Shasta-Trinity National Forest, were utilized to analyze existing watershed conditions and the effects of the project. The results of CWE modeling show that the impacts of the project do not result in watershed conditions that approach a Threshold of Concern (TOC) for adverse watershed impacts. The CWE models and TOC is discussed in the *Effects of the Proposed Action* section of this BA document.

* USDA Forest Service, 2013. Best Management Practices Monitoring, Surface Water Quality Protection, January 1993 Thru December 2012, Shasta-Trinity National Forest, Redding CA.

APPENDIX C — Cumulative Watershed Effects Model Results

CWE Model – Existing Conditions

Please see the Project Geology/Hydrology/Soils Report (2014) for greater detail on the information below. Some of the statements below come directly from that report.

The drainages encompassing the project area are largely unroaded. Hiking and stock trails exist and, while they cause localized impact to soil and water resources, they have little effect at the watershed scale. Impacts from existing and historical recreation, mining, grazing, and hunting are limited in extent. The primary disturbance to soil and water resources within the project area is from wildfire and suppression efforts. Wildfire starts may be human-caused as well as from lightning. Wildfire is a natural process within the project area; however, fire suppression has likely contributed to a shift to higher fire severity in wildfires of the last decades. Current fuel conditions in the project area increase the risk of future intense fire behavior and adverse effects to resources. See the project Fire and Fuels report for more detailed information.

Repeated wildfire, particularly with large areas of moderate and high severity, has increased the risk of landsliding and debris flows, soil erosion (loss of soil productivity), and transport of increased sediment to surface waters.. A cumulative watershed effects analysis was performed using a combination of three modeling techniques: (1) USLE – surface erosion sediment model, (2) GEO – mass-wasting sediment model, and (3) Equivalent Roaded Acre (ERA) – disturbance index model (Elder 2008). These models seek to define the extent to which watershed disturbances affect water quality, erosion, and delivery of sediment to the stream network. For the GEO and USLE models, existing levels are shown as 'percent over background', which is a measure of accelerated sedimentation. For the ERA/TOC model, existing disturbance levels are expressed as "equivalent roaded acres" (ERA).

USLE Model

This model predicts sediment delivery to streams from surface erosion based on a modified USLE equation, as described by Elder (2008). The risk ratio is the percent of predicted sediment over background values. An inference point of 400% over background is assumed.1 Recovery from surface erosion is based on vegetation cover, and a faster recovery is assumed than in the geologic and ERA (disturbance) models. This model predicts sediment delivery to stream from surface erosion based on a modified USLE equation. Eightmile Creek and Sixmile Creek-Virgin Creek show the greatest potential for increased sediment delivery due to recent large fires with relatively high severity.

1 The inference point values cited above have been used provisionally on the Klamath National Forest since the late 1980s. They played a large role in determining CWE associated with Klamath Forest Plan AWWCs (Areas with Watershed Concerns) shown in the Record of Decision for the Final Environmental Impact Statement for the Klamath National Forest [Land and Resource Management Plan]. Professional judgment and knowledge of individual watersheds originally established these values. For more detail see Elder (2008).

Table C-1. USLE Based – Surface Erosion Sediment Delivery

7th Field Watershed	Background*	Existing*	Risk Ratio	Acres	Road Miles
Eightmile Creek	224	353	0.14	6,966	0.1
Sixmile Creek-Virgin Creek	253	394	0.14	9,525	0.0
Twomile Creek-Virgin Creek	193	200	0.01	7,506	0.0
North Fork Eagle Creek	141	141	0.00	7,696	0.0
Eagle Creek-Slide Creek	197	206	0.01	10,056	0.2
Lower Slide Creek	164	185	0.03	8,254	0.0
Quinby Creek	420	431	0.01	5,629	11.4
Barron Creek-Caraway Creek	453	498	0.02	10,596	44.3

*Delivered sediment (yds^3/year).

GEO Model

This model estimates sediment **delivery** to streams from mass wasting and has its empirical base in the Salmon Sub-basin Sediment Analysis (de la Fuente and Haessig 1994) and uses methodology developed in Amaranthus et al. (1985), the Grider EIS (USDA Forest Service 1989) and the Klamath National Forest LRMP (USDA Forest Service 1995). The Salmon Sub-basin is immediately to the north of the watershed divide between the Klamath and Trinity River Systems, and geology is very similar, and as a result, the landslide coefficients should reasonably predict landslide sediment production in the project area. Predicted sediment delivery is for the first decade following project completion. Coefficients recover to background values in 50 years with no recovery in the first 10 years. For the GEO (mass wasting) model, coefficients predict sedimentation volumes from landsliding for a flood event with a recurrence interval of 10 – 20 years. In other words, the probability of attaining sedimentation rates of the magnitude predicted by the coefficients is 1 to 10 through 1 to 20 [i.e., 10% - 5% in any given year].

CWE model values are expressed as "**risk ratios**." These ratios are calculated by dividing accelerated sedimentation by an "**inference point"** value. In the GEO model, accelerated sedimentation is figured as "% over background," which is calculated from 'current' model-estimated sediment delivery ['Current' and 'Current + proposed + future' columns] less background ['Background' column] divided by background values. The inference point used is 2.0 or 200% over background.

As table C-2 below shows, Eightmile Creek, Sixmile Creek-Virgin Creek, North Fork Eagle Creek, and Quinby Creek all have predicted high sediment delivery risks. All of these drainages experienced large, relatively high-severity fires in the last decade. The model assumes no recovery for the first ten years based on the assumption that stabilizing vegetation experienced a high percentage of mortality. In this scenario, the loss of stabilizing vegetation is likely overestimated and reflects high values. Nonetheless, this analysis indicates the vulnerability of these drainages to mass wasting as a result of disturbance from generally severe wildfires.The proposed action does not create severe fire as the fire will generally back down from ridgeline area ignition.

Table C-2. Geologic Based – Mass Wasting Sediment Delivery.

7th Field Watershed	Background*	Existing*	Risk Ratio	Acres	Road Miles
Eightmile Creek	29,335	86,152	0.97	6,966	0.1
Sixmile Creek-Virgin Creek	31,176	102,344	1.14	9,525	0.0
Twomile Creek-Virgin Creek	40,063	92,304	0.65	7,506	0.0
North Fork Eagle Creek	10,566	42,256	1.50	7,696	0.0
Eagle Creek-Slide Creek	61,132	150,755	0.73	10,056	0.2
Lower Slide Creek	29,329	51,412	0.38	8,254	0.0
Quinby Creek	12,310	44,799	1.32	5,629	11.4
Barron Creek-Caraway Creek	15,546	32,935	0.56	10,596	44.3

*Delivered sediment (yds^3/10-year).

ERA Model

The ERA model tracks disturbances that affect watershed processes and provides an indicator of watershed condition. The model compares the current and proposed level of disturbance within a drainage (7th field watershed) as additive ERA coefficients, with a theoretical maximum disturbance level (TOC) developed by the Shasta-Trinity National Forest. These TOC - or thresholds of concern - range from 12% to 18% and are based on watershed sensitivity. Watershed sensitivity is calculated based on the following: soil erodibility, slope, mass wasting potential and 25-year peak flow. A TOC of 14% (highly sensitive) was used for this analysis based on the above factors.

The results of the ERA model indicate that all drainages are below the threshold of concern for cumulative watershed effects. Eightmile Creek drainage has the highest risk ratio of 0.76 or 76% of the threshold for concern. With the exception of Quinby Creek and Barron Creek-Caraway Creek, the drainages are roadless and nearly all disturbance results from wildfire. See table C-3 below.

Table C-3. Seventh-Field Watershed ERA Model: Existing Conditions

Sub-watershed (HUC6)	Drainage (HUC7)	ERA	% ERA	Risk Ratio	Disturbance Level	Acres	Road Miles
Upper New River	Barron Creek-Caraway Creek	410.03	3.87%	0.28	LOW	10,596	0.1
	Quinby Creek	241.92	4.30%	0.31	LOW	5,629	0.0
Eagle Creek	Eagle Creek-Slide Creek	586.86	5.84%	0.42	MOD	10,057	0.0
	Lower Slide Creek	264.42	3.20%	0.23	LOW	8,254	0.0
	North Fork Eagle Creek	548.54	7.13%	0.51	MOD	7,696	0.2

Sub-watershed (HUC6)	Drainage (HUC7)	ERA	% ERA	Risk Ratio	Disturbance Level	Acres	Road Miles
Sixmile Creek	Eightmile Creek	546.95	7.85%	0.56	MOD	6,967	0.0
	Sixmile Creek-Virgin Creek	606.61	6.37%	0.45	MOD	9,525	11.4
	Twomile Creek-Virgin Creek	327.87	4.37%	0.31	LOW	7,506	44.3

CWE Model – Post-Project Conditions

The cumulative watershed effects modeling results of the proposed treatments under Alternative 3 are displayed in tables C-4, C-5 and C-6 below. The largest change in risk is 17% in the North Fork Eagle Creek drainage, and the overall highest risk of 25% is in the Twomile Creek – Virgin Creek drainage. Recovery from these increases in surface would be realized substantially in the first year, and then continue to trend towards background over the next few years.

The increase in sediment delivery from mass wasting from the proposed treatments would be negligible, primarily because of the expected low to moderate severity of the prescribed fire treatments. Low severity fire is assumed to have no effect on landslide potential (GEO model) because it removes only smaller understory vegetation, and has a negligible effect on root support and slope hydrology. Since proposed prescribed fire treatments are predominantly low severity burning of understory vegetation and forest floor litter, the proposed action is not expected to result in increased mass wasting or debris flow activity above existing rates. The project is expected to result in reduced risk ratios over the long term by reducing the severity of wildfires should they occur.

The ERA model shows very little increase in % ERA toward threshold.

The proposed treatments would not prevent wildfire occurring within the project area in the next decade; however, the likelihood of smaller and/or lower severity wildfire is greater than if the treatments were not implemented. The resulting cumulative watershed effects from wildfire of lower severity would be less likely to impact downstream beneficial uses.

Table C-4. USLE based – Surface Erosion Sediment Delivery, Trinity Alps Wilderness Prescribed Fire Project – Alternative 2- Proposed Action.

7th Field Watershed	Background*	Existing*	Risk Ratio Existing	Risk Ratio Alternative 3	Acres
Eightmile Creek	224	353	0.14	0.18	6,966
Sixmile Creek-Virgin Creek	253	394	0.14	0.25	9,525
Twomile Creek-Virgin Creek	193	200	0.01	0.06	7,506
North Fork Eagle Creek	141	141	0.00	0.17	7,696
Eagle Creek-Slide Creek	197	206	0.01	0.04	10,056
Lower Slide Creek	164	185	0.03	0.08	8,254
Quinby Creek	420	431	0.01	0.01	5,629
Barron Creek - Caraway Creek	453	498	0.02	0.11	10,596

*Delivered sediment (yds^3/year).

Table C-5. Geologic Based – Mass Wasting Sediment Delivery, Trinity Alps Wilderness Prescribed Fire Project – Alternative 2.

7th Field Watershed	Background*	Existing*	Risk Ratio	Risk Ratio Alternative 3	Acres
Eightmile Creek	29,335	86,152	0.97	0.97	6,966
Sixmile Creek-Virgin Creek	31,176	102,344	1.14	1.15	9,525
Twomile Creek-Virgin Creek	40,063	92,304	0.65	0.67	7,506
North Fork Eagle Creek	10,566	42,256	1.50	1.51	7,696
Eagle Creek-Slide Creek	61,132	150,755	0.73	0.73	10,056
Lower Slide Creek	29,329	51,412	0.38	0.38	8,254
Quinby Creek	12,310	44,799	1.32	1.32	5,629
Barron Creek - Caraway Creek	15,546	32,935	0.56	0.56	10,596

*Delivered sediment (yds^3/10-year).

Table C-6. ERA Model (HUC7), Trinity Alps Wilderness Prescribed Fire Project – Alternative 3.

Drainage (HUC7)	ERA	ERA Alternative 3	Risk Ratio	Risk Ratio Alternative 3	Risk Ratio Change	Disturbance Level	Acres
Barron Creek-Caraway Creek	410.03	547.88	0.28	0.37	0.09	LOW	6,966
Eagle Creek-Slide Creek	586.86	612.06	0.42	0.43	0.01	MOD	9,525
Eightmile Creek	546.95	576.36	0.56	0.59	0.03	MOD	7,506
Lower Slide Creek	264.42	298.30	0.23	0.26	0.03	LOW	7,696
North Fork Eagle Creek	548.54	644.69	0.51	0.60	0.09	MOD	10,056
Quinby Creek	241.92	245.56	0.31	0.31	0	LOW	8,254
Sixmile Creek-Virgin Creek	606.61	720.63	0.45	0.54	0.09	MOD	5,629
Twomile Creek-Virgin Creek	327.87	395.02	0.31	0.38	0.07	LOW	10,596

APPENDIX D — Aquatic Conservation Strategy

Aquatic Conservation Strategy (ACS) Objectives

Objective 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Proposed actions will meet objective 1 at the project scale and not prevent the attainment of objective 1 at the watershed scale. Treatments are designed to restore stand structure and species diversity. Proposed treatments would accelerate the development of vegetation conditions that would have existed historically under a more natural fire regime. Treatments within riparian reserves would result in an improved trend for large wood recruitment, stream shading and other key riparian system processes. Proposed treatments would also reduce the risk of a high severity wildfire occurring within riparian reserves.

Objective 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Proposed actions will meet objective 2 at the project scale and not prevent the attainment of objective 2 at the watershed scale. Proposed treatments would not directly impact the connectivity between watersheds, subwatersheds or drainages. Proposed activities do not result in any physical or chemical barriers to migration routes or change access to spawning and rearing areas for aquatic species. In the long term, the action alternatives would improve spatial and temporal connectivity by promoting vegetation conditions that more closely represent those found under natural fire regimes for the area. As a result, the delivery of watershed products linked to fire processes would also be moved closer to conditions that existed prior to fire suppression.

Objective 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Proposed actions will meet objective 3 at the project scale and not prevent the attainment of objective 3 at the watershed scale. Project activities for either action alternative are localized over time and space and so would not cause measurable changes in channel features. Treatments within riparian reserves would maintain channel integrity and processes through the use of design features and BMPs. Peak flows are not expected to increase so increased channel cutting is not anticipated.

Objective 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Proposed actions will meet objective 4 at the project scale and not prevent the attainment of objective 4 at the watershed scale. Water quality of streams within the project area would be maintained under either action alternative. Stream shading would not be affected, so no increase in stream temperatures would occur (shading would not be reduced to less than 80 percent). Likewise, baseflow and peakflows are not expected to be measurably affected. Only minimal, short-term increases in sediment and nutrient delivery to stream are expected, as discussed below.

Objective 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Proposed actions will meet objective 5 at the project scale and not prevent the attainment of objective 5 at the watershed scale. No long-term increases in either erosion at the site of project activities or sediment delivery to stream channels and other aquatic species habitats are expected for either action alternative. There is slight short-term risk (one to three years post treatment) of increased surface erosion associated with prescribed burning actions. As a result, there may be insignificant, short-term, localized increases in instream turbidity, fine sediment, and nutrients at the site scale. This is the same process, at a smaller scale, that occurs after wildfires. Although prescribed burning removes soil cover and has the potential for short term increases in surface erosion and nutrient mobilization, impacts to aquatic habitats would not be measureable at the drainage (HUC 8), sub-watershed (HUC 7) or watershed (HUC 5) scales due to project design features and implementation of BMPs. In the long-term, if the fire regime is modified to more closely mimic a more historic regime, such that the amount of landscape burned at high intensity is reduced, then sediment production from fire disturbances would also move closer to desired historic levels.

Objective 6. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high and low flows must be protected.

Proposed actions will meet objective 6 at the project scale and not prevent the attainment of objective 6 at the watershed scale. It is unlikely that proposed activities under either action alternative would cause detectable changes in instream flows. The low intensity and patchy nature of prescribed burns reduces the potential for hydrophobic soil formation, which would reduce water infiltration. Bare areas created by prescribed fire are surrounded by unburned areas which act as buffers to slow surface flow and trap sediment. Since project activities do not increase compaction, or result in large barren or hydrophobic areas, water run-off at the site scale would not measurably increase. Roads and road drainage structures (ditches, relief culverts, etc) are the highest contributors to increasing drainage networks and delivering concentrated water flows to stream channels. Since this project occurs within the wilderness boundary (an unroaded area), it does not change road densities or road drainage patterns.

Objective 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Proposed actions will not prevent the attainment of objective 7 at the project scale or the watershed scale. Floodplains, meadows, and wetlands are all included within Riparian Reserve designations. No ground disturbing activities would take place within these areas and the proposed activities would not affect timing, variability, and duration of floodplain inundation. Treated areas may have increased soil moisture but not enough to measurably affect water table elevations.

Objective 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering,

appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Proposed actions will meet objective 8 at the project scale and not prevent the attainment of objective 8 at the watershed scale. Low severity backing fire in riparian reserves would remove accumulated ground and dead fuels, and denser low-growing understory vegetation with the intent of eliminating ladder fuels and reducing the threat of a crown fire. Large overstory vegetation would remain intact and would continue to provide thermal regulation. In the long-term, treatments in riparian reserves are expected to promote the growth of larger conifer and hardwood species already present, resulting in a more diverse forest structure and a source of coarse woody debris. Project activities move treated riparian reserves towards being more resilient to wildfire and maintain riparian processes and function.

Objective 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Proposed actions will meet objective 9 at the project scale and not prevent the attainment of objective 9 at the watershed scale. The proposed treatments in the action alternatives are designed to reduce fuel loading and move the fire regime closer to that which occurred historically on the landscape and within riparian reserves. As discussed above, allowing fire to back into riparian reserves is intended to increase the diversity and overall health of riparian communities. No adverse impacts to aquatic species are expected to occur in or downstream of the project area as a result of the project in the short term. Beneficial effects to riparian and aquatic habitat are expected in the long-term.

APPENDIX E — Environmental Baseline and Effects Summaries

Table E-1. 5th-Field Watershed: New River

		Environmental Baseline			Effects of the Action		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**	**Restore**	**Maintain**	**Degrade**
HABITAT:							
Water Quality	Temperature	X (PJ)				X	
	Suspended Sediment - Intergravel DO/Turbidity	X (EPA TMDL 2001)				X	
	Chemical Contamination/ Nutrients	X (EPA TMDL 2001)				X	
Habitat Access	Physical Barriers	X (PJ-WA)				X	
Habitat Elements	Substrate Character and /Embeddedness	X (PJ Field Visit 2011)				X	
	Large Woody Debris		X (PJ Field Visit 2011)			X	
	Pool Frequency and Quality	X (PJ Field Visit 2011)				X	

		Environmental Baseline			Effects of the Action		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**	**Restore**	**Maintain**	**Degrade**
	Large Pools	X (PJ Field Visit 2011)				X	
	Off-channel Habitat		X (PJ Field Visit 2011)			X	
	Refugia	X (Northwest Forest Plan)				X	
Channel Condition & Dynamics	Average Wetted Width/ Maximum Depth Ratio in scour pools in a reach	X (PJ-WA)				X	
	Streambank Condition	X (PJ-WA)				X	
	Floodplain Connectivity		X (PJ Field Visit 2011)			X	
Flow/Hydrology:	Change in Peak/Base Flows	X (Soil/Geo/ Hydro Report, WA)				X	
	Increase in Drainage Network	X (Soil/Geo/				X	

		Environmental Baseline			Effects of the Action		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**	**Restore**	**Maintain**	**Degrade**
		Hydro Report)					
Watershed Conditions	Road Density & Location	X (CWE Analysis)				X	
	Disturbance History	X (CWE Analysis)				X	
	Riparian Reserves - Northwest Forest Plan	X (PJ-WA)				X	
	Disturbance Regime		X (CWE Analysis, Fire/Fuels Report)			X	
SPECIES AND HABITAT							
Species and Habitat:	Summary/Integration of all Species and Habitat Indicators	X (PJ)				X	
NOTES: PJ = Professional Judgment, WA = New River Watershed Analysis, CWE Analysis = Cumulative Watershed Effects Analysis for the project, Soil/Geo/Hydro Report = The earth science specialists report for the project, Fire/Fuels Report = Fire and Fuels Specialist Report for the project, Field Visit 2011 = District Fish Biologist and staff visited project area in summer 2011 and made field observations.							

Table E-2. 7th-Field Watersheds: Eightmile Creek, Sixmile Creek-Virgin Creek, Twomile Creek-Virgin Creek, Barron Creek-Caraway Creek

DIAGNOSTIC OR PATHWAY	INDICATORS	PROP. FUNCT.	FUNCT. AT RISK	NOT PROP. FUNCT.	Restore	Maintain	Degrade
HABITAT:							
Water Quality	Temperature	X (PJ Field Visit 2011)				X	
	Suspended Sediment - Intergravel DO/Turbidity	X (EPA TMDL 2001)				X	
	Chemical Contamination/ Nutrients	X (EPA TMDL 2001)				X	
Habitat Access	Physical Barriers	X (PJ)				X	
Habitat Elements	Substrate Character and /Embeddedness	X (PJ Field Visit 2011)				X	
	Large Woody Debris		X (PJ Field Visit 2011)			X	
	Pool Frequency and Quality	X (PJ Field Visit 2011)				X	
	Large Pools	X (PJ Field Visit 2011)				X	

DIAGNOSTIC OR PATHWAY	INDICATORS	PROP. FUNCT.	FUNCT. AT RISK	NOT PROP. FUNCT.	Restore	Maintain	Degrade
	Off-channel Habitat		X (PJ Field Visit 2011)			X	
	Refugia	X (PJ, Northwest Forest Plan)				X	
Channel Condition & Dynamics	Average Wetted Width/ Maximum Depth Ratio in scour pools in a reach	X (PJ)				X	
	Streambank Condition	X (PJ)				X	
	Floodplain Connectivity		X (PJ Field Visit 2011)			X	
Flow/Hydrology	Change in Peak/Base Flows	X (Soil/Geo/ Hydro Report, WA)				X	
	Increase in Drainage Network	X (Soil/Geo/ Hydro Report)				X	
WatershedConditions	Road Density & Location	X (CWE Analysis)				X	

DIAGNOSTIC OR PATHWAY	INDICATORS	PROP. FUNCT.	FUNCT. AT RISK	NOT PROP. FUNCT.	Restore	Maintain	Degrade
	Disturbance History	X (CWE Analysis)				X	
	Riparian Reserves - Northwest Forest Plan	X (PJ)				X	
	Disturbance Regime		X (CWE Analysis, Fire/Fuels Report)			X	
SPECIES AND HABITAT							
Species and Habitat	Summary/Integration of all Species and Habitat Indicators	X (PJ)				X	
NOTES: PJ = Professional Judgment, WA = New River Watershed Analysis, CWE Analysis = Cumulative Watershed Effects Analysis for the project, Soil/Geo/Hydro Report = The earth science specialists report for the project, Fire/Fuels Report = Fire and Fuels Specialist Report for the project, Field Visit 2011 = District Fish Biologist and staff visited project area in summer 2011 and made field observations.							

Table E-3. 7th-Field Watersheds: North Fork Eagle Creek, Eagle Creek-Slide Creek, Lower Slide Creek

		Environmental Baseline			Effects of the Action		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**	**Restore**	**Maintain**	**Degrade**
HABITAT							
Water Quality	Temperature	X (PJ Field Visit 2011)				X	
	Suspended Sediment - Intergravel DO/Turbidity	X (EPA TMDL 2001)				X	
	Chemical Contamination/ Nutrients	X (EPA TMDL 2001)				X	
Habitat Access	Physical Barriers	X (PJ)				X	
Habitat Elements	Substrate Character and /Embeddedness	X (PJ Field Visit 2011)				X	
	Large Woody Debris			X (PJ Field Visit 2011)		X	
	Pool Frequency and Quality	X (PJ Field Visit 2011)				X	
	Large Pools	X (PJ Field Visit 2011)				X	

		Environmental Baseline			Effects of the Action		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**	**Restore**	**Maintain**	**Degrade**
	Off-channel Habitat		X (PJ Field Visit 2011)			X	
	Refugia	X (PJ, Northwest Forest Plan)				X	
Channel Condition & Dynamics	Average Wetted Width/ Maximum Depth Ratio in scour pools in a reach	X (PJ)				X	
	Streambank Condition	X (PJ)				X	
	Floodplain Connectivity		X (PJ Field Visit 2011)			X	
Flow/Hydrology	Change in Peak/Base Flows	X (Soil/Geo/ Hydro Report, WA)				X	
	Increase in Drainage Network	X (Soil/Geo/ Hydro Report)				X	
WatershedConditions	Road Density & Location	X (CWE Analysis)				X	

		Environmental Baseline			Effects of the Action		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**	**Restore**	**Maintain**	**Degrade**
	Disturbance History	X (CWE Analysis)				X	
	Riparian Reserves - Northwest Forest Plan	X (PJ)				X	
	Disturbance Regime		X (CWE Analysis, Fire/Fuels Report)			X	
SPECIES AND HABITAT							
<u>Species and Habitat</u>	Summary/Integration of all Species and Habitat Indicators	X (PJ)				X	
NOTES: PJ = Professional Judgment, WA = New River Watershed Analysis, CWE Analysis = Cumulative Watershed Effects Analysis for the project, Soil/Geo/Hydro Report = The earth science specialists report for the project, Fire/Fuels Report = Fire and Fuels Specialist Report for the project, Field Visit 2011 = District Fish Biologist and staff visited project area in summer 2011 and made field observations.							

APPENDIX F — Anadromous Salmonid Life History, Status and Biological Requirements

Coho Salmon

General life history information and biological requirements of SONCC coho salmon have been described in various documents (Weitkamp et al. 1995) as well as NOAA Fisheries' final rule listing SONCC coho salmon (May 6, 1997; 62 FR 24588). Adult coho salmon typically enter rivers between September and February. Spawning occurs from November to January, but occasionally as late as February or March (Weitkamp et al. 1995). Coho salmon eggs incubate for 35–50 days between November and March. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity.

Fry start emerging from the gravel two to three weeks after hatching and move into shallow areas with vegetative or other cover. As fry grow larger, they disperse up or downstream. In summer, coho salmon fry prefer pools or other slower velocity areas such as alcoves, with woody debris or overhanging vegetation. Juvenile coho salmon over-winter in slow water habitat with cover as well. Juveniles may rear in fresh water for up to 15 months then migrate to the ocean as smolts from March to June (Weitkamp et al. 1995). Coho salmon adults typically spend two years in the ocean before returning to their natal streams to spawn as three-year olds.

Generally, coho salmon spawn in smaller streams than do Chinook salmon. In California, spawning occurs mainly from November to January, although it can extend into February or March if drought conditions are present (Shapovalov and Taft 1954). In the Klamath and Eel rivers, spawning occurs in November and December (USFWS 1979). Shapovalov and Taft (1954) note that females usually choose spawning sites near the head of a riffle, just below a pool, where the water changes from a laminar to a turbulent flow and there is a medium to small gravel substrate.

Fry emerge from the gravel between March and July, with peak emergence occurring from March to May, depending on when the eggs were fertilized and the water temperature during development (Shapovalov and Taft 1954). They seek out shallow water, usually moving to the stream margins, where they form schools. As the fish feed heavily and grow, the schools generally break up and individual fish set up territories. At this stage, the fish are termed parr (juveniles). As the parr continue to grow and expand their territories, they move progressively into deeper water until July and August, when they inhabit the deepest pools. This is the period when water temperatures are highest, and growth slows (Shapovalov and Taft 1954). Food consumption and growth rate decrease during the winter months of highest flows and coldest temperatures (usually December to February). By March, parr again begin to feed heavily and grow rapidly.

Rearing areas used by juvenile coho salmon are low-gradient coastal streams, lakes, sloughs, side channels, estuaries, low-gradient tributaries to large rivers, beaver ponds, and large slack waters (PFMC 2003). The most productive juvenile habitats are found in smaller streams with low-gradient alluvial channels containing abundant pools formed by large woody debris (LWD). Adequate winter rearing habitat is important to successful completion of coho salmon life history. After one year in fresh water, smolts begin migrating downstream to the ocean in late March or early April. In some years emigration can begin prior to March (CDFG unpublished data) and can persist into July (Shapovalov and Taft 1954, Sandercock 1991). Weitkamp et al. (1995) indicate that peak downstream migration in California generally occurs from April to early June. Factors that affect the onset of emigration include the size of the fish, flow conditions, water temperature, dissolved oxygen (DO) levels, day length, and the availability of food.

Nearly all coho salmon adults destined to spawn in the Klamath/Trinity River system enter the estuary of the Klamath River in late-September through November (Yurok Tribe 1999). Migration begins purposely during this time, with spawning ensuing in November and continuing into January (US Fish and Wildlife Service and Hoopa Tribe 1999; Yurok Tribe 1999). Adult coho salmon do not “linger” in fresh water other than to wait for increased discharge from precipitation (Frederiksen, Kamine & Associates 1980). These coho salmon adults are smaller in size than adult Chinook salmon. This is attributable to the spawning adults being three year old fish and the extended juvenile residency in fresh water (Fry 1979).

Coho salmon choose habitat for spawning that is similar to that chosen by steelhead (Oncorhynchus mykiss). Coho salmon adults that spawn in the Trinity River may reflect the behavior found in other river basins of the Pacific Northwest in preferring smaller-sized streams not exceeding surface widths of one meter (Burner 1951 as cited by Sandercock 1991). Coho salmon have also been described as “not being particular” (Chamberlain 1907 as cited by Sandercock 1991).

Yearling coho salmon smolts emigrate from late March until mid-June in the Trinity River (Frederiksen, Kamine and Associates 1980; US Fish and Wildlife Service and Hoopa Tribe 1999), prior to the normal emigration times of steelhead and Chinook salmon (US Fish and Wildlife Service and Hoopa Tribe 1999). Most coho salmon smolts are 10 centimeters in fork length at the onset of emigration throughout the species range (Gribanov 1948 as cited by Sandercock 1991). They generally migrate at the water surface during the night in schools of 10-50 cohorts of similar size (Shapavalov and Taft 1954). Coho salmon emigration timing in the Trinity River reflects the general timing patterns of coho salmon elsewhere in California (Shapovalov and Taft 1954) by normally peaking in May (US Fish and Wildlife Service and Hoopa Tribe 1999). Although the majority of coho salmon smolts may be routinely moving downriver in May, they do not appear to require specific water temperature cues to initiate their emigration (Frederiksen, Kamine and Associates 1980).

Broad knowledge of the distribution and run size of naturally produced coho salmon in the Trinity River has been described as trailing that for Chinook salmon and steelhead (Frederiksen, Kamine & Associates 1980). Coho salmon were noted as occurring only in small numbers in the Klamath River nearly 70 years ago (Snyder 1931), but have also been described as historically occurring in abundance within the basin (CDFG 1994 as cited by NMFS 1995). Coho salmon have comprised the smallest population of the three anadromous salmonid species inhabiting the Trinity River.

Coho salmon juveniles were identified in irrigation diversions upriver from the current location of Trinity Lake in the 1950s .This discredited an earlier belief that coho salmon did not migrate upriver from the point of the confluence of the South Fork Trinity River (Moffett and Smith 1950). Coho salmon were captured annually for five years beginning in 1958 during the operation of the Lewiston fish trapping facility during construction of Trinity Dam (Frederiksen, Kamine & Associates 1980). This marked the first collection of data of spawning coho salmon in the Trinity River basin (Frederiksen, Kamine & Associates 1980).

Wild coho salmon adults were captured annually in the following numbers from 1958-1962: 583, 93, 138, 318, and 7 individuals, respectively (Frederiksen, Kamine & Associates 1980). Expansion estimates indicated that on average, approximately 2,000 coho salmon adults migrated annually upriver past Lewiston for spawning from 1958-1962 (Frederiksen, Kamine and Associates 1980). This estimate provided the CDFG the value for the Trinity Dam coho salmon mitigation requirement at the federal hatchery facility now located at the base of Lewiston Dam (VTN 1979). The adult annual escapement returns to Trinity River hatchery during its first three years of operation were also comprised of wild coho salmon and were 72, 48, and 3 individuals, respectively.

Placer mining, followed shortly by more destructive hydraulic gold mining, commenced within the Trinity River basin in the 1850s. Efforts soon expanded at such a frenetic pace that the river did not flow clearly until World War I began, when, for the first time in decades, mining activity ceased (Smith 1981). Millions of cubic yards of colluvial material were eroded into tributary stream courses and the mainstem Trinity River during the mining era. Many tributaries were routinely blocked by stream crossings and small dams. Diversions required for the hydraulic activity also dewatered salmonid habitat (Coots 1956 as cited by VTN 1979). The anadromous fish resource of the Trinity River was likely reduced by about one-third because of the century-long intensive mining activities

Commercial fishing began in the late 1800's in the Klamath River estuary but was forced to close in 1934 with the passage of legislation. One estimate of salmonids harvested annually by this operation was 72,000 individuals (Snyder 1931). Snyder commented that depletion of salmonid stocks was occurring at a rapid rate, and smaller adults appeared to be returning to the estuary toward the end of the commercial activity. An estimated 600 coho were harvested annually in river sport catch above Willow Creek from 1977 to 1997 (CDFG as cited by NMFS 1997).

Up to 200,000 Klamath basin salmonid adults may have been harvested per year from 1916-1943 when combining basin fishery harvest with ocean harvest, or ocean harvest alone after the estuary fishery closure (VTN 1979). Moffett and Smith (1950) estimated that the combined Trinity River origin Chinook and coho salmon catch resulting from commercial ocean fishing was 70,000 individuals. From 1952 until the completion of the Trinity River Diversion, the ports of Fort Bragg, Eureka, and Crescent City each received from a few thousand coho salmon up to 40,000 to 60,000 individuals annually (Frederiksen, Kamine and Associates 1980).

Commercial timber harvesting began in earnest after the end of World War II when the "post-war housing boom" started. Fifty-six lumber mills were erected in Trinity County within ten years, processing 600 million board feet of lumber annually from timber provided by 1.1 million forested acres within the Trinity basin (California Department of Water Resources 1962). Thousands of miles of forest roads were rapidly constructed to access the timber. This was all done when there was no regulatory language in state and federal forest practice laws protecting water quality and fish habitat.

Salmonid runs were decimated when the 1964 flood devastated the area, occurring immediately after this great liquidation of timber in the Trinity River basin. The residual salmonid populations may have been halved by the late 1960s (California Resources Agency 1970). The Trinity River Diversion (TRD) was completed during the same time period, blocking the flushing flows from the upper river that would have better transported the large volumes of tributary sedimentation.

The TRD impounds and diverts most of the natural runoff from the uppermost 750 square miles of the watershed, or about one-fourth of the Trinity basin. Located at RM 112, the TRD creates a permanent migration barrier for the three anadromous salmonid species of the Trinity River system. It is stated in numerous documents that an estimated 59 miles of mainstem and tributary habitat were blocked from access by the larger Chinook salmon, while 109 miles of access were blocked for the more agile steelhead. It is now assumed that the extent of access blocked for coho salmon is the same as the estimate for steelhead (Frederiksen, Kamine and Associates 1980).

The proposed site for the TRD was estimated to block half of the basin access for Chinook salmon, and greater than half of the natural habitat for steelhead (Moffett and Smith 1950). More than half of the superior habitat for coho salmon was blocked by the TRD because upriver is where the majority of the coldest, clearest water was to be found in summer (US Fish and Wildlife Service and Hoopa Tribe 1999). The inhospitable temperatures occurring in much of the mainstem Trinity River in summer, prior to TRD construction, somewhat limited mainstem steelhead and coho salmon production downriver from the TRD because coho salmon and steelhead rear for more than twelve months in freshwater (Moffett and Smith 1950).

The physical changes to the Trinity River that initiated with TRD impoundment in 1961 were rapid, dramatic and are described ubiquitously in literature. One example follows: The Trinity River Division of "the Central Valley Project has resulted in the loss of possibly the most important salmon and steelhead habitat in the Trinity. The hatchery has not been able to compensate for this natural production loss. The reduced flows in the Trinity River have prevented flushing of sediment, stopped gravel recruitment, prevented scouring of spawning riffles, promoted filling of holding pools and thermal refuges, allowed an increase in riparian vegetation encroachment, disrupted physical cues for salmon and changed the temperature regime in the river" (VTN 1979).

The changes described above were preceded in the 1950's by at least one report that predicted an overall beneficial result to the fishery resources of the Trinity basin after completion of the TRD (VTN 1979). But within a decade of completion, it became obvious that the impacts were contrary to the wording in the TRD enabling legislation (Hubbell 1973 as cited by US Fish and Wildlife Service and Hoopa Tribe 1999) and inconsistent with the federal government's responsibility to protect the anadromous fish resource held in trust for Indian tribes (US Fish and Wildlife Service and Hoopa Tribe 1999).

The most dramatic change to the Trinity River upon completion of the TRD was the diversion of up to 90% of the natural runoff reaching the Trinity Reservoir and the attenuation of the peak spring snowmelt freshets to an even greater extent (North Coast Water Quality Control Board 1989). The ability to transport sediments, delivered from the upper basin and tributaries, was reduced from approximately 200,000 cubic yards annually to 10,000 cubic yards (US Fish and Wildlife Service 1980). Grass Valley Creek, a tributary entering the Trinity River several miles below Lewiston, is comprised largely of decomposed granitic geology and soil. The stream was estimated to contribute over 100,000 cubic yards of sediment annually to the Trinity River prior to recent restoration and construction of sediment entrapment ponds (North Coast Water Quality Control Board 1989). Coarse mainstem bedload transport therefore ceased for all of the larger particle sizes historically mobilized, while fine-grained materials delivered from the tributaries infiltrated the smaller diameter spawning gravels and at least partially filled historically deep pools (Frederiksen, Kamine and Associates 1980).

The average annual flow released to the Trinity River has been gradually increasing since the scheduled average of 120,000 acre feet from 1964-1981 (intermittent unscheduled weather-related releases account for an actual average of 220,000 acre feet during that period). In 1981, the Interior Department issued a document directing Reclamation to set Trinity River discharges at 340,000, 220,000, or 140,000 acre feet annually, depending on the precipitation pattern for each year. Realized annual discharges then ranged from approximately 200,000 to 1,200,000 acre feet for the ensuing decade, including unscheduled releases. Another Secretarial order declared, in 1991, that annual scheduled releases approximate 340,000 acre feet. Actual releases, again combining those scheduled with safety-of-dam weather releases, have exceeded this level in each of the past five years. Despite these increases, discharge from Lewiston Dam continues to be significantly less than the historic flow level except from mid-summer until the occurrence of the first fall rains (BLM 1995).

The elimination of snowmelt and subtropical storm freshets has allowed riparian vegetation to proliferate virtually unabated for many of the initial years after TRD completion. The increase in the surface area of riparian zone vegetation was greater than 300% during the first 15 years after TRD completion (Evans 1980). This rapid proliferation was largely attributable to the attenuation of the highly variable, often large spring snow melt and warm rain floods. Plant survival was insured by adequate minimum discharges released during the droughty summers which do not allow normal desiccation of the new vegetation (Evans 1980). Monthly releases were greatly reduced from November through July and augmented in August and September (BLM 1995). Comparing aerial photographs of the mainstem below Lewiston in 1960 and 1989, 81% of the mainstem channel area was originally composed of open water and gravel bars. By 1989, riparian vegetation accounted for 67% of this total, with gravel bar surface area dropping by 95% from the previous value (BLM 1995; Wilson 1993).

The morphology of the river evolved rapidly to accommodate flow releases that seldom exceeded 50% of the reservoir inflow. Most often, the releases were only from 9-13% of the inflow during the first 15 years of operation (US Fish and Wildlife Service and Hoopa Tribe 1999). While the mainstem transport capacity was greatly reduced, the sediment production from the tributaries was rapidly increasing, especially during and immediately after the December, 1964 flood (Frederiksen, Kamine and Associates 1980). The river became channelized geomorphologically because the proliferating vegetation could continuously entrap fine tributary sediment. This material was available because of the absence of mainstem flood flow releases. Channel narrowing progressed, coarser sediments became buried, and depth increased despite passing less water, as a consequence of berm encroachment (BLM 1995; US Fish and Wildlife Service and Hoopa Tribe 1999).

Information on coho salmon population trends in the Trinity River basin is incomplete, but available information indicates that populations are small to nonexistent in some years. Existing information indicates that coho salmon adults are present in the Trinity River in early September and juvenile coho salmon are present in the mainstem Trinity River throughout the year, including summer months, and also inhabit a number of tributaries (NMFS 1999).

Returns to Trinity River Hatchery for the period 1973-1980 averaged 3,277 adults (Leidy and Leidy 1984). An average of 2,700 SONCC coho salmon returned to Trinity River Hatchery from 1991-1995. During this period an average of 5,600 coho salmon spawned inriver, of which approximately 98 percent (5,500) were hatchery returns spawning inriver (USFWS 1999). From 1991 through 1995, naturally produced SONCC coho salmon spawning in the Trinity River upstream of the Willow Creek weir averaged 200 fish, ranged from 0 to 14 percent of the total annual escapement (an annual average of 3 percent) (USFWS 1999).

One hundred percent of coho salmon smolts released from Trinity River hatchery have been marked with a right maxillary fin clip since 1996, accounting completely for the 1994 brood year and following brood years hence. Of 4,709 coho salmon entering the fish hatchery in the fall of 1998, 97% possessed the maxillary clip. A much smaller sample captured at the Willow Creek weir led CDFG to conclude that a similar overall percentage of naturally produced coho salmon comprised the total coho salmon run during the fall of 1998 (CDFG 1999). In the previous year, with field staff unable to benefit yet from the complete marking effort, a total of 36,660 coho salmon adults were estimated to escape into the Trinity River. Despite the large number, there is no evidence to suspect the ratio of origin to be significantly different than recent comparisons.

Coho streams on the Upper Trinity River within the boundary of the STNF include the New River and tributaries, Big French Creek, Price Creek, Manzanita Creek, North Fork Trinity River and tributaries, Canyon Creek, Oregon Gulch, Soldier Creek, Dutch Creek, Browns Creek, Weaver Creek and tributaries, Rush Creek and Deadwood Creek. Coho use of Reading Creek, Indian Creek, and Grass Valley Creek is suspected, but suitable habitat is located off of National Forest lands.

Chinook Salmon

Chinook salmon mature between 2 and 6+ years of age (Meyers et al. 1998). Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991 in Meyers et al. 1998). Post-emergent fry seek out shallow, near shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans.

The optimum temperature range for rearing Chinook salmon fry is 50°F to 55°F (Rich 1997) and for fingerlings is 55°F to 60°F (Rich 1997). In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. The optimal thermal range for Chinook during smoltification and seaward migration is 50°F to 55°F (Rich 1997

Chinook salmon addressed in this document exhibit an ocean-type life history, and smolts out migrate predominantly as subyearlings, generally during April through July. Chinook salmon spend between 2 and 5 years in the ocean (Healey 1991), before returning to freshwater to spawn. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return, and are referred to as jacks (males) and jills (females). Genetic analysis indicated that this Evolutionary Significant Units form a unique group that is quite distinctive compared to neighboring Evolutionary Significant Units. The majority of spring- and fall-run fish emigrate to the marine environment primarily as subyearlings, but have a significant proportion of yearling smolts. Recoveries of Coded Wire Tags indicate that both runs have a coastal distribution off the California and Oregon coasts.

The UKT Chinook salmon ESU includes fall- and spring-run Chinook salmon in the Klamath and Trinity River Basin. Historically, spring-run Chinook salmon were probably the predominate run. This ESU still retains several distinct spring-run populations, albeit at much reduced abundance levels. Fish from this ESU exhibit an ocean-type life history; however genetically and physically, these fish are quite distinct from coastal and Central Valley (CV) Chinook salmon ESUs. Genetic analysis indicated that this ESU form a unique group that is quite distinctive compared to neighboring ESUs. The majority of spring- and fall-run fish emigrates to the marine environment primarily as subyearlings, but has a large proportion of yearling smolts. Recoveries of coded wire tags indicate that both runs have a coastal distribution off the California and Oregon coasts.

Chinook salmon in the Klamath River Basin upstream of the Trinity River confluence comprises the UKT ESU. The USDA-FS designated river-type “spring-run” Chinook salmon a “Sensitive” species. Adult spring Chinook salmon have a unique life history that involves migrating to the upper reaches of the natal stream during spring and summer. Much of the summer is spent holding in pools where they mature sexually. The spawning period usually begins during the latter part of September and continues through October.

This life history pattern differs from the fall-run, which enter freshwater with almost mature gametes and spawn soon after during the fall period, usually lower in the watershed than spring-run Chinook salmon. Hyampom located at the confluence of the SFTR and Hayfork Creek is loosely considered the break between the distribution of spring and fall Chinook salmon on the SFTR. However, during years of drought or years having above average precipitation and higher fall flows, there may be considerable overlap in the distribution and use of spawning areas.

Chinook salmon spawn in clean gravels in streams and in the mainstem of some rivers. Depending on temperature, eggs incubate in redds for 1.5 to 4 months before hatching as alevins. Following yolk-sac absorption, alevins emerge from the gravel as fry and begin feeding. They require cold water, deep pools, and cover. Fall Chinook salmon fry grow quickly and will emigrate from freshwater between 60 and 120 days after emergence.

In contrast, Spring Chinook salmon will rear in river for approximately 1 year before immigrating to the ocean in early spring. A major limiting factor for juvenile Chinook salmon is water temperature which strongly affects growth and survival (Moyle 2002). For a complete life history description and status review see Meyers et al. (1998).

Salmon River spring-run Chinook salmon counts have been conducted annually since 1990 (Figure F-2). Historically, salmon spawning runs in the SFTR (Figure F-2) were dramatically larger than they are today; spring Chinook represented the largest salmonid runs in the SFTR basin. In 1963 and 1964, prior to the December 1964 flood, spring Chinook escapement was greater than 10,000 fish (Healey 1963, La Faunce 1967; in EPA 1998). This is consistent with anecdotal observations of large numbers of fish in the river The December 1955 flood probably also affected the fish population temporarily; an aerial redd count in 1958 noted only 101 spring Chinook redds. However, large sediment deliveries to the stream were not observed between 1944 and 1960. Furthermore, indications are that the spawning run had recovered prior to the 1964 flood.

In the early 1960s, the intensity of road building and timber harvest increased significantly. Since the 1964 flood, the UKT spring Chinook population has not recovered to anywhere near those former levels. It is possible that the runs in 1963 and 1964 were anomalously large, and the goal of 6,000 spring Chinook estimated for the Trinity River Restoration Program may be more reasonable to indicate recovery of the run. It is therefore appropriate to assume approximately 4,000 spring Chinook would represent recovery in the South Fork basin In the 16 years between 1989 and 2004, SFTR counts of adult spring-run Chinook salmon averaged 290 fish annually, ranging from 1,097 fish in 1996, to 7 fish in 1989. During this same time period (1989-2004), Salmon River spring-run Chinook have averaged 681 fish annually, ranging from 1,300 fish in 1993, to 148 fish in 1990 The low number of spring-run Chinook salmon in the SFTR are largely a response to the 1964 flood, which triggered landslides that filled in holding pools and covered spawning beds (Moyle 2002).

Figure F-1. South Fork Trinity River annual spring Chinook salmon and summer steelhead surveys from 1990 – 2013. There was no survey done in 2008 due to wildfires

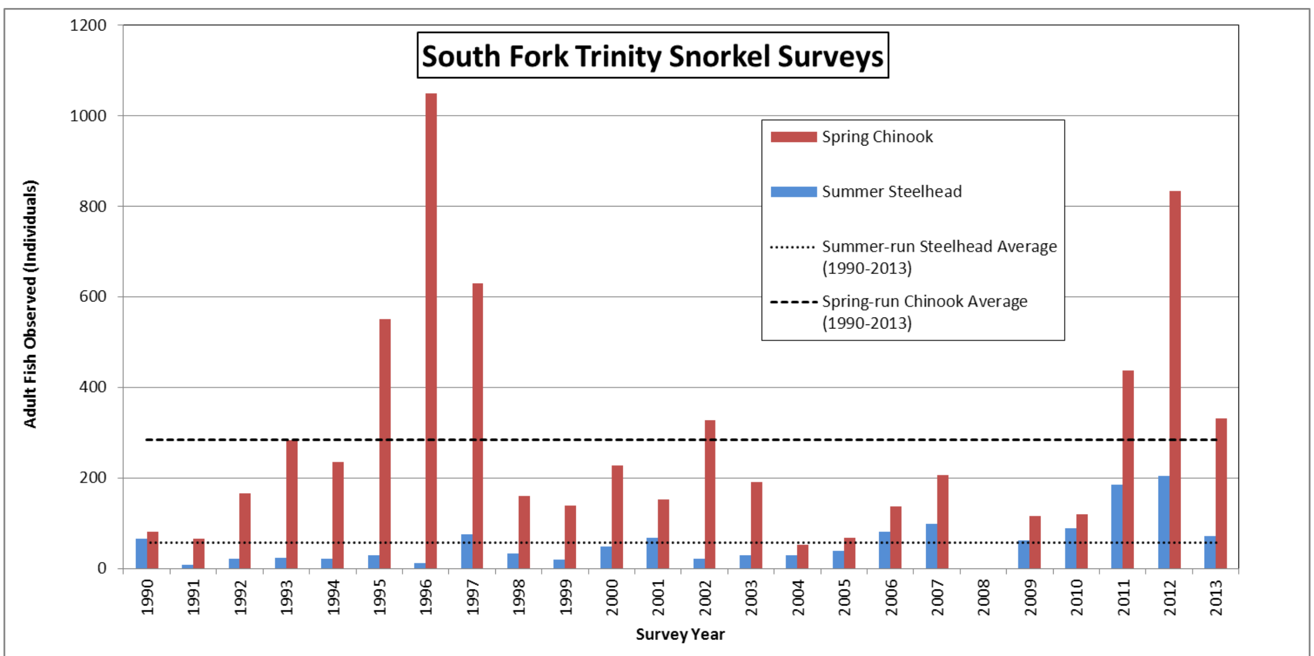

Figure F-2. Salmon River annual spring Chinook salmon surveys from 1990-2013

Fall Chinook escapement in the SFTR basin has not been estimated as consistently as spring Chinook. La Faunce (1967) estimated 3,337 fall Chinook in 1964, prior to the flood. No estimates were made again until the 1980s, at which time the escapement was estimated to be as low as 345 in 1990 and as high as 2,640 in 1985 (Jong & Mills 1997). Because the spring Chinook run was more significantly affected than the fall run, indicators for both runs are included to provide a more rounded picture of desired conditions. For example, spring Chinook return to the basin in the spring and hold in the streams over the summer, while fall Chinook run in the fall; over-summer factors may have caused the greater decreases in the spring Chinook population. For fall Chinook, which haven't diminished in numbers in the SFTR basin as dramatically as spring Chinook, 3,000 returning spawners is a reasonable number to indicate population recovery.

Higher spring Chinook escapement in the 1990s may reflect the early stages of population recovery, coincident with apparent movement of sediment downstream, or it may reflect better conditions in those particular years. The current size of the spawning population, while growing, still remains at less than 10% of the run in 1963 and 1964, and less than 20% of the Trinity River Restoration Program goal (4,000 fish).

The diminished fish populations in the basin, which began both with the period of increased management and the record flood in the basin, are the strongest indication of impaired habitat conditions, and recovered populations will be the strongest indication of recovered habitat conditions. In the future, if salmonids naturally reproduce at numbers that are close to those observed prior to 1964, it would be reasonable to conclude that habitat conditions are adequately supporting beneficial uses. If sediment has limited habitat by aggrading the channel, then continued downstream movement of sediment would probably be required to restore the habitat conditions.

However, it is also clear that: 1) habitat recovery, in the form of normal watershed processes moving both the natural sediment load and the elevated sediment load (i.e., due to land management activities) through the stream system, is a slow process, and may not be observed for another 50 years or more; and 2) other factors, such as habitat conditions or fishing pressures outside of the SFTR basin (e.g., downstream or ocean conditions) may retard progress on recovery of the fishery even if the habitat conditions have recovered. Thus, while a recovered Chinook spawning population would indicate recovery of the beneficial use support and attainment of water quality standards more clearly than any other indicator, it is not required that the spawning population recover in order to demonstrate attainment of water quality standards, if all other targets are met.

The following information was summarized from NOAA Fisheries' status review of Chinook salmon (Meyers et al. 1998). Chinook salmon mature between 2 and 6+ years of age. Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Post-emergent fry seek out shallow, near shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans.

The optimum temperature range for rearing Chinook salmon fry is 50°F to 55°F (Rich 1997, Seymour 1956) and for fingerlings is 55°F to 60°F (Rich 1997). In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. The optimal thermal range for Chinook salmon during smoltification and seaward migration is 50°F to 55°F (Rich 1997). Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn. Chinook salmon addressed in this document (spring- and fall-run UKT Chinook salmon) exhibit an ocean-type life history, and smolts out-migrate predominantly as subyearlings, generally during April through July. Chinook salmon spend between 2 and 5 years in the ocean (Healey 1991), before returning to freshwater to spawn. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return.

The UKT Chinook salmon ESU includes fall- and spring-run Chinook salmon in the Klamath and Trinity River Basin. Historically, spring-run Chinook salmon were probably the predominate run. This ESU still retains several distinct spring-run populations, albeit at much reduced abundance levels. Fish from this ESU exhibit an ocean-type life history; however genetically and physically, these fish are quite distinct from coastal and Central Valley Chinook salmon ESUs. Genetic analysis indicated that this ESU form a unique group that is quite distinctive compared to neighboring ESUs. The majority of spring- and fall-run fish emigrates to the marine environment primarily as subyearlings, but has a large proportion of yearling smolts. Recoveries of coded wire tags indicate that both runs have a coastal distribution off the California and Oregon coasts.

Historically, the SFTR had large runs of spring-run salmon and an annual run of summer-run steelhead (DWR 1982, in Barnhart 1986). Healy estimated that 7,000 to 10, 000 spring-run Chinook salmon spawned in the SFTR and its tributaries. In 1964, La Faunce (1967) estimated the spring-run Chinook population to be 11,600 fish. The number of spring-run Chinook salmon returning the SFTR after the 1964 flood declined significantly. Annual comprehensive adult surveys in the SFTR have been conducted since 1991. For the period 1991-2003, spring-run Chinook numbers have ranged from 66 to 1,097 fish, averaging 348 fish.

Lower Hayfork Creek supports a remnant run of spring Chinook salmon. Historically, spring Chinook salmon utilized the lower reaches of Salt Creek, Big Creek, Tule Creek, and East Fork Hayfork Creek (PWA, 1994). The current distribution is approximately the boundary between the Middle and Lower Hayfork Creek 5th field watersheds. Thirty-two spring-run Chinook salmon and 29 spring-run

Chinook redds were observed between RM 12 and RM 17 in surveys conducted in 2003. However, only a few fish and 0 redds were observed in the same reach in 2001 and 2002 surveys.

Steelhead

Biologically, steelhead can be divided into two basic run-types, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Burgner et al. 1992 in Busby et al. 1996). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (August 9, 1996, 61 FR 41542). South of Cape Blanco, Oregon, summer steelhead are known to occur in the Rogue, Smith, Klamath, Trinity, Mad, and Eel rivers, and in Redwood Creek (Busby et al. 1996).

Winter steelhead enter fresh water between November and April in the Pacific Northwest (Busby et al. 1996), migrate to spawning areas, and then spawn, generally in April and May (Barnhart 1986). Some adults, however, do not enter some coastal streams until spring, just before spawning. Steelhead require a minimum depth of 0.18 meters (7 inches) and a maximum velocity of 2.44 meters/second (8 feet/second) for active upstream migration (Smith 1973). Spawning and initial rearing of juvenile steelhead generally take place in small, moderate-gradient (generally 3%–5%) tributary streams (Nickelson et al. 1986). A minimum depth of 0.18 meters, water velocity of 0.30–0.91 meters/second (1–3 feet/second) and clean substrate 0.6–10.2 cm (0.25–4 inches) (Nickelson et al. 1986) are required for spawning.

Steelhead spawn in 3.9–9.4°C (39°F–49°F) water. Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching, generally between February and June After two to three weeks, in late spring, and following yolk sac absorption, alevins emerge from the gravel and begin actively feeding. After emerging from the gravel, fry usually inhabit shallow water along banks of perennial streams. Fry occupy stream margins (Nickelson et al. 1986).

Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson et al. 1986).

Steelhead prefer water temperatures ranging from 12–15°C (54°F–59°F). Juveniles live in freshwater from one to four years (usually two years in the California Evolutionary Significant Units), then smolt and migrate to the ocean in March and April (Barnhart 1986). Winter steelhead populations generally smolt after two years in fresh water (Busby et al. 1996).

Coastal steelhead (*O. mykiss irideus*) in Klamath basin, have evolved multiple life history and reproductive strategies for persisting in a system where critical habitat parameters are highly variable. Klamath River steelhead are recognized to constitute two distinct reproductive ecotypes that migrate from the ocean into tributaries during different time periods (Busby et al. 1996). However, different life stages of steelhead are found in the Klamath mainstem every month of the year, including a run of immature fish (commonly referred to as the “half-pounder”) which overwinter in freshwater before returning to the ocean the following spring (USFWS, 1998). Klamath River steelhead are an anadromous form of coastal rainbow trout (*O. mykiss irideus*).

Steelhead exhibit the largest geographic range and most complex suite of traits of any salmonid species. Steelhead share many of the characteristics of rainbow trout that contribute to their ability to adapt to systems that are highly unpredictable and undergo frequent disturbance. Particularly important characteristics of Klamath River steelhead include anadromy (emigrating to the ocean and returning to spawn in freshwater) or nonanadromous freshwater residency, iteroparity (multiple spawning migrations), and natal homing. Watershed disturbances caused by agriculture, timber harvest practices, past mining and water diversions have negatively affected the fishery resources within the basin (KRBFTF 1991).

The Klamath River and its tributaries support the largest population of coastal steelhead remaining in California (McEwan and Jackson 1996). Klamath River steelhead are part of the KMP ESU, which the NMFS determined was not warranted for listing under the ESA (NMFS 2001).

NMFS does not classify Klamath River basin steelhead "races" based on run-timing of adults, but instead recognizes two distinct reproductive ecotypes of coastal steelhead in the Klamath based upon their reproductive biology and freshwater spawning strategy (Busby et al. 1996). Burgner et al. (1992) identified the stream-maturing type as entering the river sexually immature and still requiring several months before ripening to spawning condition. In the Klamath River, Busby et al. (1996) called these summer steelhead and found they migrated upstream between April and October with a peak in spawning behavior during January.

The second type, ocean-maturing, enter the Klamath River between September and March with a peak in spawning in March. These fish enter the river sexually mature and spawn shortly after reaching spawning grounds (Busby et al. 1996). The overlap in migration and spawning periods make differentiating these ecotypes difficult (Roelofs 1983). A genetic study determined that different runs of steelhead within a particular subbasin of the Klamath-Trinity system shared more genetic similarities than populations of similar run-timings in adjacent basins (Reisenbichler et al. 1992).

Before establishing feeding locations, newly hatched steelhead move to shallow, protected margins of the stream (Royal 1972 in McEwan and Jackson 1996). Once aggressive behavior is exhibited, territories become established and are defended (Shapovalov and Taft 1954) in or below riffles, where food production is greatest. Moffett and Smith (1950) found steelhead fry (individuals not yet surviving a winter) favored tributary streams with a peak in downstream movement during the early summer on the Trinity River.

Possible physical influences leading to a decline in this behavior included decreasing river flows and increasing water temperatures. As higher flows and lower water temperatures returned to the mainstem during the late fall and winter, Moffett and Smith (1950) observed an increase in downstream movement. Steelhead parr (individuals surviving at least one winter) showed the greatest freshwater movement towards the end of their first year and spent their second year inhabiting the mainstem.

The large majority of steelhead (86%) in the Klamath River basin apparently spend two years in fresh water before undergoing smoltification (the physiological process of preparing to survive in ocean conditions) and migrating to sea (Hopelain 1998). Kesner and Barnhardt (1972) determined that steelhead rearing in fresh water for longer periods made their seaward migration more quickly. Klamath River basin steelhead remain in the ocean for one to three years before returning to spawn and their ocean migration patterns are unknown. It is believed that steelhead use their excellent homing sense to return to the same area they lived in as fry to spawn (Moyle 2002).

The presence of “half-pounder” steelhead in the Klamath River basin is a distinguishing life history trait of steelhead found in the KMP ESU. Half-pounder steelhead are subadults that have spent 2-4 months in the Klamath estuary or nearshore before returning to the river to overwinter. They overwinter in the lower and mid-Klamath regions before returning to the ocean the following spring. The presence of half-pound fish is uncommon above Seiad Valley (Kesner and Barnhardt 1972). The occurrence of half-pounders was greater in spawning fish of mid-Klamath region tributaries (86-100%) when compared to the Trinity River (32-80%). There is a negative linear relationship between rates of half-pounder migration and first-time spawning size. The lowest occurrence of half-pounders was from Lower Klamath River winter-run steelhead (17%), which also demonstrated the greatest first-year growth rate (Hopelain 1998). The proportion of “half-pounders” that become stream- or ocean-maturing ecotypes is not known.

Iteroparity (the ability to spawn more than once) is an important character of steelhead that makes them different from most all other *Oncorhynchus* species. Hopelain (1998) reported that repeat spawning varied between different run-timings. The frequencies of steelhead having undergone multiple reproductive events varied in range from 17.6 to 47.9% for fall run, 40.0 to 63.6% for spring run, and 31.1% for winter run fish. Females make up the majority of repeat spawners (Busby et al. 1996), and lay between 200 and 12,000 eggs (Moyle 2002). Nonanadromous coastal rainbow trout typically contain fewer than 1,000 eggs, while steelhead contain about 2,000 eggs per kilogram of body weight (Moyle 2002).

Steelhead trout are found in two distinct assemblages depending on their phenotype (Moyle 2002). *O. mykiss irideus* are found above and below barriers to anadromy. Above barriers in cold, fast-moving tributaries in the Lower Klamath River coastal rainbow trout are found alone or with coastal cutthroat trout (Moyle 2002). The anadromous form of rainbow trout are found in an assemblage that includes other salmon, Klamath small scale suckers, speckled dace, and marbled sculpin species in the Klamath River. This species association is a product of the physical landscape as well as interspecies interactions between fish. Potentially, environmental fluctuations keep the populations of each species from reaching a size where competition and territoriality is important (Moyle 2002).

Alternatively, in the reaches of streams where this diverse assemblage is observed, a high degree of habitat heterogeneity allows segregation of species into microhabitats and may eliminate interspecies interactions. In the presence of other juvenile salmonids (coho and Chinook), steelhead have been observed to distribute themselves in microhabitats different from the other species (Everest and Chapman 1972). Steelhead are successful competitors and can display aggressive behavior to defend territories (Jenkins 1969 in Moyle 2002). Juvenile rainbow trout have a positive interaction with suckers in the Sacramento River, and possibly form the same relationship in the Klamath River. In the Sacramento, juveniles were observed to follow large suckers around and feed on invertebrates disturbed by the suckers feeding (Baltz and Moyle 1984). Studies of intraspecies interactions have reported steelhead segregating themselves spatially within the same stream into microhabitats (Moyle 2002, Keeley and McPhail 1998).

However, little is known about the relationship between different cohorts, including half-pounders, in the Klamath River. In one study on a coastal California stream (Harvey and Nakamoto 1997), the intraspecific interactions among different cohorts were dependent on the habitat occupied by the fish. In deep water, Harvey and Nakamoto (1997) observed larger steelhead in the presence of small steelhead to grow faster than when these fish were observed together in shallow waters.

Food availability has a larger impact on territory size than body size, and juvenile steelhead were observed to intrude into adjacent steelhead territories to capture food (Keeley and McPhail 1998). Moffett and Smith (1950) observed schools of steelhead parr in the thalweg along the bottom during extended winter dry periods on the Trinity River. This may be favored habitat because this deeper, faster water contains more invertebrate drift (Britain and Eikeland 1988) and offers greater protection from predators.

Two hatcheries are currently operated by the CDFG as mitigation for lost habitat beyond Iron Gate and Lewiston Dams. While hatchery production has primarily relied upon native broodstock, numerous transfers of fish from outside the basin are documented. Prior to 1973, transfers came from the Sacramento, Willamette, Mad and Eel Rivers (Busby et al. 1996). Since the length of freshwater occupancy of juvenile Klamath River steelhead is long, wild fish are at a potentially increased risk from hatcheries. About 1,000,000 smolts per year are produced by the two hatcheries (Busby et al. 1994 in Moyle 2002).

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APPENDIX G — Shasta-Trinity National Forest Matrix of Factors and Indicators

This matrix shows criteria used to determine baseline conditions in 7th and 5th field watersheds.

Modifications agreed to by Level 1 representatives Allen Taylor (NMFS) and Loren Everest (USFS) on March 3, 2006.

Table G-1. Matrix of Criteria Used to Determine Baseline Conditions in 7th and 5th Field Watersheds.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
HABITAT				
Water Quality	**Temperature** [1] 1st - 3rd Order Streams [instantaneous]	67 F degrees or less	> 67 to 70 degrees F	> 70 degrees F
	4th-5th Order Streams [7 Day Mean Maximum]	70 degrees F or less	> 70 to 73 degrees F	> 73 degrees F
	Suspended Sediment - Intergravel DO/Turbidity[2]	Similar to Chinook salmon: for example (e.g.): < 12% fines (<0.85mm) in gravel; e.g., ≤12% surface fines of ≤6mm. Turbidity Low	Similar to Chinook salmon : e.g., 12-17% fines (<0.85mm) in gravel; e.g., 12-20% surface fines of ≤6mm. Turbidity Moderate	Similar to Chinook salmon: e.g., >17% fines (<0.85mm) in gravel; e.g., >20% surface fines of ≤6mm. Turbidity High
	Chemical Contamination/ Nutrients[3]	Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches due to chemical or nutrient contamination.	Moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach due to chemical or nutrient contamination.	High levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach due to chemical or nutrient contamination.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
Habitat Access	**Physical Barriers**[4] *The intent of this variable is to evaluate passage barriers to all life stages.	No human-made barriers present in watershed.	One or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows.	Human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage.
Habitat Elements	**Substrate Character and /Embeddedness (in areas of the gravels and subsurface areas)**[5] *The intent of this is to evaluate habitat quality for rearing.	Less than 15% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness less than 20%.	15% to 20% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and/or cobble embeddedness is 20% to 25%.	Greater than 20% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness greater than 25%.
	Large Woody Debris[6]	More than 40 pieces of large wood (>16 inches in diameter and > 50 feet in length) per mile AND current riparian vegetation condition near site potential for recruitment of large woody debris.	40 to 20 pieces of large wood (>16 inches in diameter and > 50 feet in length) per mile OR current riparian vegetation condition below site potential for recruitment of large woody debris.	Less than 20 pieces of large wood (>16 inches in diameter and > 50 feet in length) per mile AND current riparian vegetation condition well below site potential for recruitment of large woody debris.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Pool Frequency and Quality[4]	Pool frequency in a reach closely approximates the frequency values listed below and large woody debris recruitment standards for properly functioning habitat (above); pools have good cover and cool water, and only minor reduction of pool volume by fine sediment. Salmon and Steelhead: **channel width # pools/mile** 5 feet 184 10 " 96 15 " 70 20 " 56 25 " 47 50 " 26 75 " 23 100 " 18	Pool frequency is similar to values listed in "functioning appropriately", but large woody debris recruitment is inadequate to maintain pools over time; pools have inadequate cover/temperature, and/or there has been a moderate reduction of pool volume by fine sediment	Pool frequency is considerably lower and does not meet values listed for "functioning appropriately"; also cover/temperature is inadequate, and there has been a major reduction of pool volume by fine sediment.
	Large Pools[4] (in adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow)	Each reach has many large pools >1 meter deep.	Reaches have few large pools (>1 meter) present.	Reaches have no deep pools (>1 meter).
	Off-channel Habitat[7] (evaluated for stream types that are not naturally entrenched)	Watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are low energy areas.	Watershed has some ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas.	Watershed has few or no ponds, oxbows, backwaters, or other off-channel areas.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Refugia[4]	Habitats capable of supporting strong and significant populations are protected (e.g., by intact riparian reserves or conservation areas, ground water upwelling areas, and seeps); and are well distributed and connected for all life stages and forms of the species.	Habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species.	Adequate habitat refugia do not exist.
Channel Condition & Dynamics	**Average Wetted Width/ Maximum Depth Ratio in scour pools in a reach**[8]	W/D ratio < 12 on all reaches that could otherwise best be described as 'A', 'G', and 'E' channel types. W/D ratio > 12 on all reaches that could otherwise best be described as 'B', 'F', and 'C' channel types. No braided streams formed due to excessive sediment load	Less than 25% of the surveyed reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in some alluvial reaches because of excessive aggradation due to high sediment loads.	More than 25% of the reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in many alluvial reaches as a result of excessive aggradation due to high sediment loads
	Streambank Condition[9] (Based on USFS Region 5 Stream Condition Inventory Survey Methods)	> 90% stable; i.e., on average, < 10% of banks are actively eroding.	80% - 90% stable	< 80% stable

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
Flow / Hydrology	**Floodplain Connectivity[4]**	Off-channel/side channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession.	Reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation, and succession.	Severe reduction in hydrologic connectivity between off-channel/side channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation, and succession altered significantly.
	Change in Peak/ BaseFlows[10]	Watershed is in condition class I according to the STNF Cumulative Watershed Effects (CWE) model. Watershed exhibits high hydrologic integrity relative to its natural potential condition.	Watershed is in condition class II according to the STNF CWE model. Watershed exhibits moderate hydrologic integrity relative to its natural potential condition.	Watershed is in condition class III according to the STNF CWE model. Watershed exhibits low hydrologic integrity relative to its natural potential condition.
	Increase in Drainage Network[4]	Zero or minimum increases in active channel length correlated with human caused disturbance (e.g., trails, roadside ditches, compaction, impervious surface, etc).	Low to moderate increase in active channel length correlated with human caused disturbance (e.g., trails, roadside ditches, compaction, impervious surface, etc).	Greater than moderate increase in active channel length correlated with human caused disturbance (e.g., trails, roadside ditches, compaction, impervious surface, etc).
Watershed Conditions	**Road Density & Location[4]**	Salmon and Steelhead: <2 mi/mi^2	Salmon and Steelhead: 2-3 mi/mi^2	Salmon and Steelhead: >3 mi/mi^2

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Disturbance History[10] (Based on STNF ERA modeling)	CWE model shows that the watershed is in Condition Class 1. Clarify and verify conditions and risk through field reviews and/or other available info, as available. The watershed contains 15% or more Late Successional Old Growth habitat[11].	CWE model shows that the watershed is in condition class 2. Clarify and verify conditions and risk through field reviews and/or other available info, as available. The watershed contains 15% or more Late Successional Old Growth habitat11.	CWE model shows that the watershed is in condition class 3. Clarify and verify conditions and risk through field reviews and/or other available info, as available. The watershed contains less than 15% Late Successional Old Growth habitat[11].
	Riparian Reserves - Northwest Forest Plan[4]	Adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/ composition >50%.	Moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian conservation areas, or incomplete protection of habitats and refugia for sensitive aquatic species (□70-80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better.	Areas are fragmented, poorly connected, or provide inadequate protection of habitats for sensitive aquatic species (<70% intact, refugia does not occur), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/composition <25%.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Disturbance Regime[4]	Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. Natural processes are stable.	Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. 1Natural processes are unstable.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
SPECIES AND HABITAT				
Species and Habitat	**Summary/Integration of all Species and Habitat Indicators**[4] *This is intended to be a summary statement for narrative describing an overall rating for the population and habitat indicators. The statements in the columns are examples not criteria.	Bull Trout Example Habitat quality and connectivity among subpopulations is high. The migratory form is present. Disturbance has not altered channel equilibrium. Fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat. The subpopulation has the resilience to recover from short-term disturbance within one to two generations (5 to 10 years). The subpopulation is fluctuating around equilibrium or is growing.	Bull Trout Example Fine sediments, stream temperatures, or the availability of suitable habitats have been altered and will not recover to pre-disturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. The subpopulation is stable or fluctuating in a downward trend.	Bull Trout Example Cumulative disruption of habitat has resulted in a clear declining trend in the subpopulation size. Under current management, habitat conditions will not improve within two generations (5 to 10 years). Little or no connectivity remains among subpopulations. The subpopulation survival and recruitment responds sharply to normal environmental events.

Footnotes to Trinity River tributaries matrix of factors and indicators

The Streamlined Consultation Procedures for Section 7 of the Endangered Species Act, July 1999 page IV-A-1 encouraged Level 1 teams to adapt the general matrix, as necessary, to reflect local geographic and climactic influences. It added that "…Level 1 teams may add, delete, or modify pathways and/or indicators, as necessary, to address particular life history and/or habitat requirements of fish species or life stages being considered by the team."

In June of 2004 the Shasta Trinity National Forest Level1 team adopted the Shasta Trinity National Forest Matrix of factors and indicators, in which some indicators had values changed based on locally applicable reference conditions, some indicators dropped the original models in favor of Region 5 models and some indicators were dropped due to redundancies. The Analytical Process for developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (AP) (USDA and USDI 2004) contains an updated version of the original Matrix of Pathways and Indicators (Matrix). The 2004 Matrix contains direction that "All indicators must be evaluated; however, criteria values presented here are not absolute and may be adjusted for local watersheds given supportive documentation."

The following footnotes represent the supportive documentation for adjusting criteria values of the 2004 AP Matrix to the upper Trinity River geographical area and to Cumulative Watershed Effects models currently in use on the Shasta Trinity National Forest.

(1) **Stream Order according to Strahler (1957).** Proper Functioning criterion for 4th/5th Order streams derived from temperature monitoring near the mouth of streams considered to be pristine or nearly pristine (North Fork Trinity and New Rivers - 5th order, East Fork North Fork Trinity and New Rivers near East Fork- 4th order (Data on file at the Weaverville Ranger District). Seven-day maximum temperatures as high as 71.8 degrees F have been recorded on these streams, however, the average is just less than 70 degrees F. At Risk criterion for 4th/5th order streams derived from monitoring in streams that support populations of anadromous fish, although temperatures in this range (70 to 73.0 degrees F) are considered sub-optimal. Not Properly Functioning is sustained temperatures above 73.0 degrees F that cause cessation of growth and approach lethal temperatures for salmon and steelhead.

Properly Functioning criterion for 1st - 3rd order streams is derived from Proper Functioning criterion for 3rd order streams derived from temperature monitoring near the mouth of streams considered to be pristine or nearly pristine (Devils Canyon Creek, East Fork New River, Slide Creek, and Virgin Creek). At Risk and Not Properly Functioning are assigned on a temperature continuum with values given for 4th/5th order streams, with the maximum instantaneous temperature of At Risk of 1st - 3rd order streams coinciding with the minimum 7-day maximum of 4th/5th order At Risk streams. Similarly for the Not Properly Functioning category.

(2) Criteria unchanged from USDA et al. (2004). Turbidity levels are further defined below:

Properly Functioning: Water clarity returns quickly (within two days) following peak flows.

At Risk: Water clarity slow to return following peak flows.

Not Properly Functioning: Water clarity poor for long periods of time following peak flows. Some suspended sediments occur even at low flows or baseflow.

(3) Criteria unchanged from USDA et al. (2004). The language for CWA303d listing was clarified to exclude reaches listed due to sediment.

(4) Criteria unchanged from USDA et al. (2004).

(5) Criteria based on interpretation of Figure 4.13 from Bjornn and Reiser (1991). The STNF feels that cobble embeddedness is a highly variable measure and that quantifying surface fine sediment is a more repeatable measure for analyzing substrate character. Literature is readily available to link fine sediment levels to the health of salmonids.

Properly functioning: <15% fine sediment >80% emergence of salmonids.

At Risk: 15%-20% fine sediment >50% emergence of salmonids

Not properly functioning: >20% fine sediment < 50% emergence of salmonids.

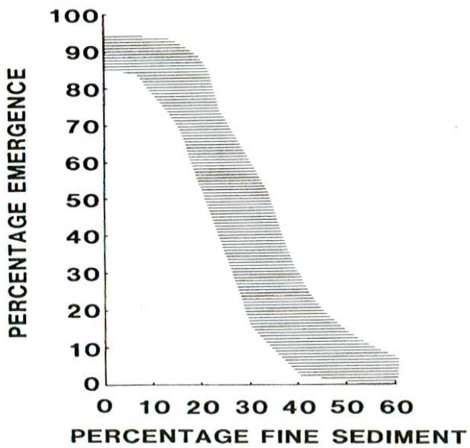

Figure 4.13. Percentage of swim-up fry placed in gravel sand mixtures in relation to the percentage of sediment smaller than 2-6.4mm in studies by Bjornn (1968), Phillips et al. (1975), Hausle and Coble (1976), and McCuddin (1977). The stippled area includes data from eight tests on Brook trout, steelhead, and Chinook and coho salmon.

(6) **Properly Functioning LWD** criteria derived from stream surveys of 25 stream reaches on the Trinity River Management Unit. Reaches used to define properly functioning condition currently or historically supported anadromous fish, have had minimal timber harvest, and stream channels were not cleaned during historical mining. Criteria for LWD recruitment potential is based on professional judgment of Loren Everest, STNF west zone fishery biologist.

(7) Criteria unchanged from USDA et al. (2004); however, channel type clarification added to address local conditions. Based on Rosgen (1994).

(8) Width to depth (W/D) ratio for various channel types is based on delineative criteria of Rosgen (1994). Properly Functioning means that W/D ratio falls within expected channel type as determined by the other four delineative factors (entrenchment, sinuosity, slope, and substrate). Aggradation on alluvial flats causing braiding is well known phenomenon that often accompanies changes in W/D ratio as watershed condition deteriorates. At Risk and Not Properly Functioning levels are determined by professional judgment based on observation of streams on the west side of the Shasta-Trinity National Forest.

(9) USDA Forest Service (1998).

(10) Shasta Trinity National Forest uses Equivalent Roaded Area/Threshold of Concern (ERA/TOC) Model (Haskins 1986) to determine the existing risk ratio as well as the effect risk ratio. Therefore, the ECA values are not used in Region 5 analysis; instead the ERA/TOC model is used. ERA/TOC provides a simplified accounting system for tracking disturbances that affect watershed processes, in particular, estimates in changes in peak runoff flows influenced by disturbance activities. This model is not intended to be a process-based sediment model, however it does provide an indicator of watershed conditions. This model compares the current level of disturbance within a given watershed (expressed as %ERA) with the theoretical maximum disturbance level acceptable (expressed as %TOC). ERA/TOC (or “risk ratio”) estimates the level of hydrological disturbance or relative risk of increased peak flows and consequent potential for channel alteration and general adverse watershed impacts. TOC is calculated based on channel sensitivity, beneficial uses, soil erodibility, hydrologic response, and slope stability. The TOC does not represent the exact point at

which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed.

Susceptibility of CWE generally increases from low to high as the level of land disturbing activities increase towards or past the TOC (FS Handbook, 2509.22-23.63a).

CWE Analysis Threshold of Concern and Watershed Condition Class: The Environmental Impact Statement for the Shasta Trinity National Forest Land and Resource Management Plan (USDA Forest Service 1994) established TOC for 5th field watersheds and defines Watershed Condition Class (WCC). The WCC are defined as follows:

Watershed Condition Class I: ERA less than 40 percent TOC;

Watershed Condition Class II: ERA between 40 and 80 percent TOC; and

Watershed Condition Class III: ERA greater than 80 percent TOC.

The following summarizes the FSM 2521.1 - Watershed Condition Classes. The ERA evaluates watershed condition and assigns one of the following three classes:

1. Class I Condition. Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.

2. Class II Condition. Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.

3. Class III Condition. Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, riparian, and aquatic systems do not support beneficial uses.

(11) Late Successional Old Growth from Northwest Forest Plan, 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management.

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APPENDIX H — Coral Complex Addendum

Addendum to the Fisheries Biological Assessment, the Supplemental Aquatic Species Biological Evaluation and the Fisheries Management Indicator Species Report for the Trinity Alps Wilderness Prescribed Fire Project

Trinity River Management Unit

Shasta-Trinity National Forest

Siskiyou and Humboldt Counties, California
Humboldt Meridian: T70N R70E Sections 1 through 24; T70N R80E Sections 6, 7; T80N R60E Sections 1, 11, 12, 13, 14, 23, 24; T80N R70E Sections 1 through 36; T80N R80E Sections 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31 and 32; T90N R60E Sections 24, 25; T90N R70E Sections 17 through 36; T90N R80E Sections 29, 30, 31, 32; and Mount Diablo Meridian: T370N R120W Sections 6, 7, 8, 17, 18, 19, 20, 29, 30; T380N R120W Section 31.

Responsible Official: Dave Meyers, Forest Supervisor

Prepared By_Francine Smith_ **Date:** 03/31/2014

Francine Smith – Fisheries Biologist
USFS ACT2 Enterprise Unit

Reviewed By______________________________ **Date:** ____________

William Brock – Fisheries Biologist
USFS Shasta-Trinity National Forest
Fisheries/Aquatics Program Manager

Purpose of this Addendum

A fisheries biological assessment (BA), a supplemental aquatic species biological evaluation (BE) and a fisheries management indicator species (MIS) report were completed on June 5, 2012 for the Trinity Alps Wilderness Prescribed Fire Project on the Trinity River Management Unit, Shasta-Trinity National Forest.

The original BA, original supplemental BE and original fisheries MIS report, all on file at the Weaverville Ranger District, contain the details on the proposed action and other alternatives, the affected environment and additional information for analysis.

Since that time, the Corral Complex fires burned on the Six Rivers and Shasta-Trinity National Forests during the summer of 2013 resulting in potential changes in aquatic habitat conditions within the project area. Additionally, sensitive species were added to the Region 5 Regional Forester's Sensitive Species list in summer of 2013. This addendum analyzes the effects of the changed conditions on threatened and sensitive aquatic species and on aquatic management indicator assemblages, and whether the determinations of effects to those species disclosed in the original analyses are still valid.

Description of Changed Conditions

Multiple fires that ignited on August 10, 2013 grew together to form the Corral Complex, burning approximately 13,098 acres, of which approximately 800 acres burned in the Trinity Alps Prescribed Fire project area (see Figure H-1).

Post-fire changes to vegetation were quantified using the USDA Forest Service Rapid Assessment of Vegetation Conditions after Wildfire (RAVG).[1]

Table H-1: Acres in each burn severity class within the project area

Burn Severity Class	Grid code	Acres Within Project Area	Percentage Burned in Project Area by Severity Class
Unchanged	1	549	69%
Low	2	150	19%
Moderate	3	57	7%
High	4	44	5%

Unchanged: This severity class indicates that the area one year after the fire was indistinguishable from pre-fire conditions. This does not always indicate the area did not burn.
Low: Represents areas of surface fire with little change in cover and 10-25 percent mortality of the structurally dominant vegetation.
Moderate: This severity class indicates a mixture of effects on the structurally dominant vegetation, with 26-75 percent mortality.
High: Represents areas where the dominant vegetation has high to complete (75-100 percent) mortality.

Of the 800 acres that burned within the project area, the RAVG[2] data classified approximately 70% of the burned area as mostly unchanged. There are smaller portions (approximately 30%) of low-, moderate- and high-severity classes with about 25% in the low to moderate burn severity classes. Overall, the fire that burned within the project area was of low to moderate severity and low to moderate intensity with only about 5% of the burn within the project area classified at high severity.

[1] See 'References' section of this report for direct download of RAVG data
[2] USDA Forest Service 2012

Table H-1 above displays the acres and percentages of acres burned in the project area by burn severity class.

Existing Conditions and Affected Environment

Affected Species

The conservation status of aquatic and terrestrial invertebrates on national forest lands was evaluated by following the Region 5 Sensitive Species List Update Process, and a new Region 5 sensitive species list was established on June 30, 2013, updated on September 9, 2013. Detailed information of the status of aquatic mollusks added to the list is discussed in a draft biological evaluation written for new Pacific Southwest Region sensitive mollusk species.[3] For the Shasta-Trinity National Forest three aquatic species were added to the Region 5 sensitive species list and include black juga (snail) (*Juga nigrina*), kneecap lanx (limpet) (*Lanx patelloides*) and pacific lamprey (fish) (*Entosphenus tridentatus*).

Black Juga
Black juga is a freshwater snail found in spring pool and stream habitats. This species and other members of this genus are thought to live about 5 to 7 years and reach maturity in about 3 years. They prefer cool water temperatures below 18^{o} C and saturated dissolved oxygen levels. Black juga are not known to disperse far, typically a few meters in the summer months in stream habitats.[4]

This species has been historically described as commonly occurring in tributaries of the Sacramento River and interior drainages of northeastern California, locally in the upper Klamath River, the uppermost Eel River drainage, the Napa River and coastal streams of Mendocino County (Big and Noyo rivers) and south into the Russian River drainage of Sonoma County.[5] More recent documentation describes black juga, as presently understood taxonomically, restricted to the upper Sacramento system in California with populations in Clear Creek, Shasta County, upstream of Whiskeytown Lake and in tributaries upstream of Shasta Lake.[6]

The Trinity Alps Wilderness Prescribed Fire project occurs outside of the range of the black juga.

Kneecap Lanx
Kneecap lanx is a freshwater limpet found in fast flowing, cold, well-oxygenated streams and spring-fed pools. Its distribution is spotty and confined to very localized suitable habitats defined by coarse substrates and relatively high water velocities. Lanx species are highly sensitive to water temperature, oxygen availability and sedimentation because they have no gills and breathe directly through their mantle tissue. They firmly attach to large rocks in fast currents so as not to be swept away.[7]

This species was historically widespread throughout the Sacramento River system but is now found at scattered sites in the upper Sacramento River, McCloud River and Pit River drainages upstream of Shasta Lake.[8]

The Trinity Alps Wilderness Prescribed Fire project occurs outside of the range of the kneecap lanx.

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[3] Furnish 2013
[4] Ibid
[5] Taylor 1981 in Furnish 2013
[6] Frest and Johannes 1995 in Furnish 2013
[7] Furnish 2013
[8] Furnish 2013 and Frest and Johannes 1995 in Furnish 2013

Pacific Lamprey

The Pacific lamprey is an anadromous and parasitic fish widely distributed in Pacific coast streams from Japan through Alaska and down the western North America coast to Baja California.[9]

Pacific lampreys are jawless fish with a cylindrical body and sectorial disk mouth; they lack paired fins, vertebrae and swim bladders. Swimming is accomplished through lateral undulations of the body from nose to tail (anguilliform swimming). Their sectorial disk allows them to attach to surfaces, release and propel forward with a swimming burst, and re-attach to a new surface. Thus, they can maneuver over obstacles and move upstream through high water velocities.[10]

Anadromous Pacific lamprey in the adult life stage spend up to 3 years in the ocean. Landlocked forms spend their adult life stage in lakes or reservoirs. Adults migrate up rivers and streams to spawn, generally in March through July, and die after spawning. Spawning habitat consists of gravel beds in low to moderate gradient stream reaches and may have relatively high sand and silt content. In the larval stage, Pacific lamprey burrow into mud, sand and fine gravels located in slow, depositional areas (e.g. pools, eddies), spending 4-6 years, filter feeding on algae, diatoms, detritus and other microscopic organisms.[11]

Pacific lamprey juveniles transform into sub-adults and out-migrate to the ocean during rising stream flows in later winter or early spring. Parasitic tooth development occurs during this transformation, prior to them entering salt water. Once in salt water, adults feed on a variety of marine and anadromous fish, and are preyed upon by sharks, sea lions, birds and other marine mammals.[12]

The abundance and distribution of Pacific lamprey has significantly declined throughout its range over the past three decades. Many factors have contributed to this decline, including: impeded passage and entrainment at dams and water diversion structures, altered stream flows and dewatering of stream reaches, dredging, chemical poisoning, poor ocean conditions, degraded water quality, disease, over-utilization, introduction and establishment of non-native fishes, predation, and stream and floodplain degradation.[13]

Existing Habitat Conditions

The Corral Fire burned into two 7th-field subwatersheds in the project area, Quinby Creek and Twomile Creek – Virgin Creek. As shown in Table 2, Twomile Creek-Virgin Creek subwatershed provides 9.5 miles of anadromous fish habitat and Quinby Creek subwatershed does not provide habitat for anadromous fish species.

Table H-2. Miles of Anadromous Fish Habitat by Subwatershed

7th Field Watersheds	HUC	Miles of Anadromous Habitat
Twomile Creek-Virgin Creek	18010211100103	9.5
Quinby Creek	18010211100401	0

[9] USFWS 2010 and Moyle 2002
[10] USFWS 2010
[11] Close and others 2002, Moyle 2002 and USFWS 2010
[12] USFWS 2004 and USFWS 2010
[13] Luzier et al 2009 in USFWS 2010

Soil burn severity within the fire perimeter was calculated using Burned Area Reflectance (BARC). Post-fire soil burn severities are discussed in detail in the Burned Area Report.[14] Soil burn severities were analyzed for both of the affected subwatersheds and are shown in Table 3. Twomile Creek-Virgin Creek had about two percent of its acreage burned at low, moderate and high severities, while Quinby Creek had about four percent of its acreage burned at low, moderate and high severities. When considering just the low-, moderate- and high-intensity burned acreage within both subwatersheds, over 99 percent burned at low to moderate intensity and less than one percent burned at high intensity.

Table H-3. Corral Fire Soil Burn Severity for 7th-field Watersheds Within the Project Area (in acres)

7th Field Watershed	Total Acres	Unburned	Low	Mod	High	Total Burned at Low, Mod, High	% Burned at Low, Mod, High
Twomile Creek-Virgin Creek	7506	7382	72	52	1	125	2%
Quinby Creek	5630	5382	166	79	2	247	4%

The only proposed treatment areas that burned during the Corral Complex were approximately 125 acres in the 'Salmon Summit to Fawn Ridge' unit. This ridgetop unit is proposed for prescribed fire of low-to-mixed severity, with fire predicted to back downhill approximately 1,000 feet from the main ridgetop. Prescribed fire in this unit is not expected to reach any riparian reserve areas; furthermore, the unit is not adjacent to anadromous fish habitat.

Environmental Consequences

Since the Trinity Alps Wilderness Prescribed Fire Project occurs outside of the range of black juga (*Juga nigrina*) and kneecap lanx (*Lanx patelloides*) there would be no direct, indirect or cumulative effects to these species or their habitats from implementation of either action alternative.

Implementation of Alternative 2 or 3 **would not affect individuals or habitat, and would not result in a trend toward federal listing or loss of viability** for black juga or kneecap lanx.

Pacific lamprey habitat conditions are similar to aquatic habitat conditions necessary for survival and recovery of threatened southern Oregon northern California coast (SONCC) coho salmon, and the long term viability of upper Klamath/Trinity (UKT) Chinook salmon-spring run, upper Trinity River (UTR) Chinook salmon-fall run and Klamath mountain province (KMP) steelhead trout. Furthermore, within the Trinity Alps Wilderness Prescribed Fire project action area, Pacific lamprey are assumed to be distributed in the same stream reaches as KMP steelhead trout. Therefore, all proposed actions would have similar effects to Pacific lamprey and the analysis of effects of proposed actions on anadromous salmonids in the fisheries BA would be appropriately applied to Pacific lamprey, which is also an anadromous fish.

As discussed on page 15 in the Fisheries BA for the Trinity Alps Wilderness Prescribed Fire project, there is no probability for proposed actions within the Quinby Creek subwatershed to affect anadromous fish or their habitat. Four percent of the Quinby Creek subwatershed was burned during the Corral Complex fire at low and moderate intensities. Additionally most of the burned areas are along ridgelines. There would be no measureable effects from the Corral Complex fire to hydrology,

[14] USDA Forest Service 2013a

soils, or geology resources.[15] Thus, Quinby Creek subwatershed conditions post-fire combined with proposed actions would continue to have no effect to anadromous fish species and their habitat and this subwatershed will not be discussed further.

Alternative 1- No Action

Direct and Indirect Effects

The Corral Complex fire had little effect on the project area. Current fuel and vegetation conditions within the project area following the Corral Complex still present a high risk of high severity wildfire, which could have adverse impacts to watersheds and streams and in turn have adverse impacts to anadromous fish, other aquatic species and aquatic habitats. The effects analyses in the fisheries BA and supplemental aquatic species BE remain valid. The direct and indirect effects analysis for Alternative 1 in the original fisheries MIS report remains valid.

Effects Common to Both Action Alternatives

Direct, Indirect and Cumulative Effects

The changed condition due to the Corral Complex fire burning in the Twomile Creek-Virgin Creek subwatershed is unlikely to have measurable direct or indirect effects on soil, water, or geologic resources as they relate to the Trinity Alps Prescribed Fire Project.[16] Additionally, there were no effects from the Corral Complex fire to the other six 7th-field subwatersheds included in the action area. As a result, there would not be direct effects to aquatic species or their habitats, nor any measurable changes from indirect effects to habitat indicators including water quality, habitat access, habitat elements, channel condition and dynamics, flow hydrology and watershed conditions as a result of the Corral Complex Fire.

The direct, indirect and cumulative effects analyses in the original fisheries BA, supplemental aquatic species BE and fisheries MIS report remain valid. The Endangered Species Act and Essential Fish Habitat effects determinations in the fisheries BA remain valid. The sensitive species determinations in the supplemental aquatic species BE remain valid. There is no change to the management indicator analysis summary.

Viability of Pacific Lamprey

Implementation of the STNF LRMP Standards and Guidelines, which are designed to reverse the trend of habitat degradation, as well as address long-term persistence of aquatic species, would primarily contribute to species viability in the Action Area. Overall, implementation of either action alternative would help maintain the health of forested ecosystems by improving watershed health and resilience to disturbance, thereby reducing the risk of sedimentation into stream channels, lowering the risk of watershed impacts associated with high intensity fire including surface erosion, landsliding, loss of riparian vegetation, channel sedimentation, and altered flow regimes.

The project design standards and incorporated resource protection measures (including BMPs) would minimize or prevent adverse effects to Pacific lamprey and its habitat at the site scale and minimize effects to this species downstream at the 8th- and 5th-field watershed scales. A trend toward listing under the ESA is not anticipated, and viability is not at risk relative to this project because short-term effects on aquatic habitat would be insignificant, the project meets LRMP Standards and Guidelines, and the project would not negatively affect Pacific lamprey habitat in the long term.

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[15] USDA Forest Service 2013b

[16] Ibid

Based on the analysis of anadromous fish and anadromous fish habitat in the project fisheries BA, it is my determination that implementation of either action alternative may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability of Pacific lamprey.

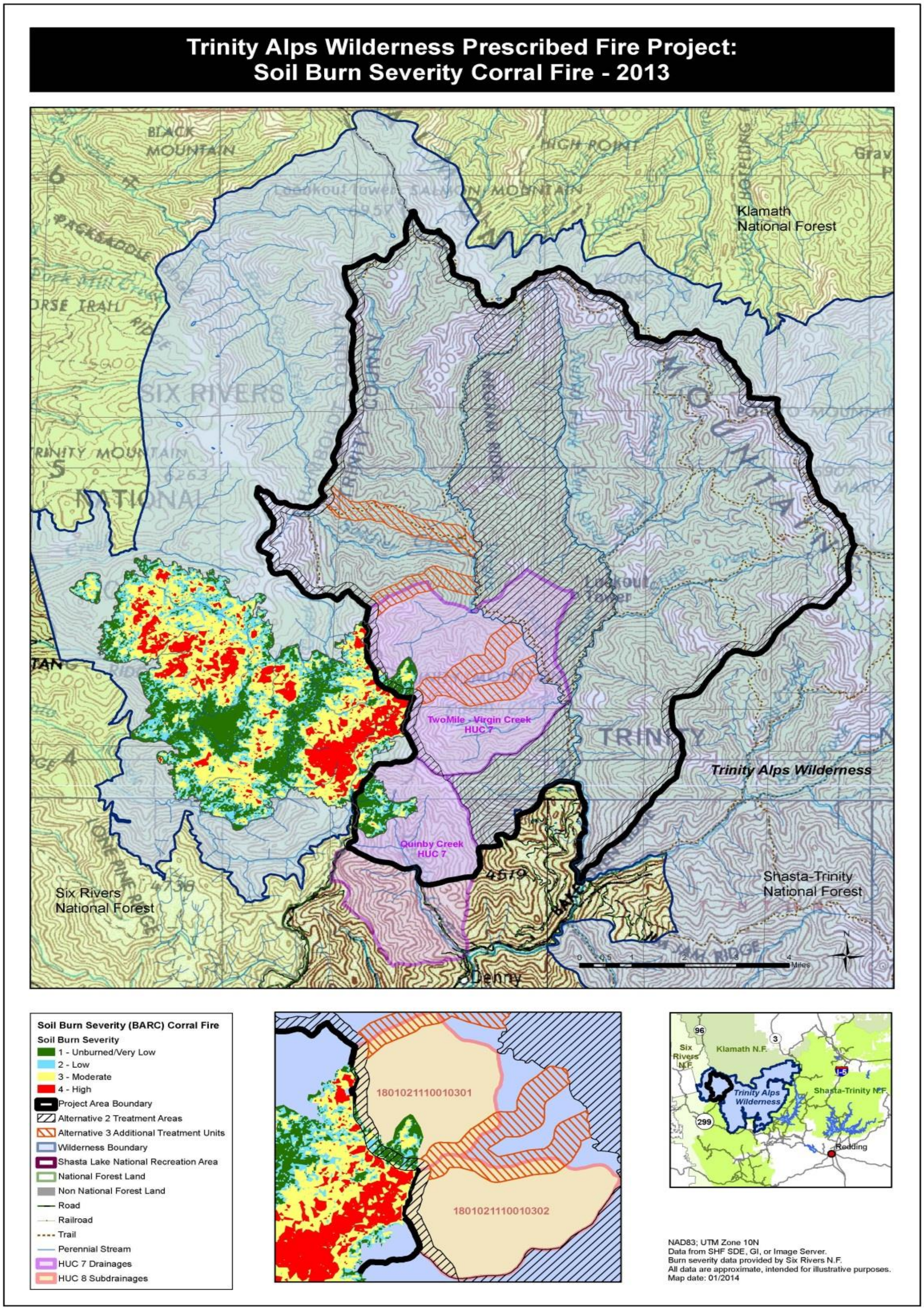

Figure H-1. Corral Fire post-fire burn severity in the project area

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APPENDIX I — River Complex Addendum

Second Addendum to the Fisheries Biological Assessment, the Supplemental Aquatic Species Biological Evaluation and the Fisheries Management Indicator Species Report for the Trinity Alps Wilderness Prescribed Fire Project

Trinity River Management Unit

Shasta-Trinity National Forest

Siskiyou and Humboldt Counties, California
Humboldt Meridian: T70N R70E Sections 1 through 24; T70N R80E Sections 6, 7; T80N R60E Sections 1, 11, 12, 13, 14, 23, 24; T80N R70E Sections 1 through 36; T80N R80E Sections 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31 and 32; T90N R60E Sections 24, 25; T90N R70E Sections 17 through 36; T90N R80E Sections 29, 30, 31, 32; and Mount Diablo Meridian: T370N R120W Sections 6, 7, 8, 17, 18, 19, 20, 29, 30; T380N R120W Section 31.

Responsible Official: Scott Russell, Forest Supervisor

September 28, 2018

Prepared By____ Date:_____________
Amelia Fleitz – Fisheries Biologist
USFS Shasta-Trinity National Forest
Westside Fisheries Technician

Reviewed By____Date: _____________
William Brock – Fisheries Biologist
USFS Shasta-Trinity National Forest
Fisheries/Aquatics Program Manager

Purpose of this Addendum

A fisheries biological assessment (BA), a supplemental aquatic species biological evaluation (BE) and a fisheries management indicator species (MIS) report were completed on June 5, 2012 for the Trinity Alps Wilderness Prescribed Fire Project on the Trinity River Management Unit, Shasta-Trinity National Forest and updated in November, 2014[1].

The original BA, original supplemental BE and original fisheries MIS report, all on file at the Weaverville Ranger District, contain the details on the proposed action and other alternatives, and the affected environment and additional information for analysis. An addendum in 2014 updated the existing conditions post Corral Complex fires and analyzes the Sensitive Species added to the Region 5 Regional Forester's Sensitive Species list in the summer of 2013[2].

Since that time, lightning fires burned into the River Complex on the Six Rivers and Shasta-Trinity National Forests during the summer of 2015 resulting in potential changes in aquatic habitat conditions within the project area. This addendum analyzes the effects of the changed conditions on threatened and sensitive aquatic species and on management indicator fish assemblages, and whether the determinations of effects to those species disclosed in the original analyses are still valid.

Description of Changed Conditions

Multiple lightning fires that ignited on July 31, 2015 grew together to form the River Complex, burning approximately 77,805 acres of which approximately 6,055 acres burned in the Trinity Alps Prescribed Fire project area (see Figure I-1).

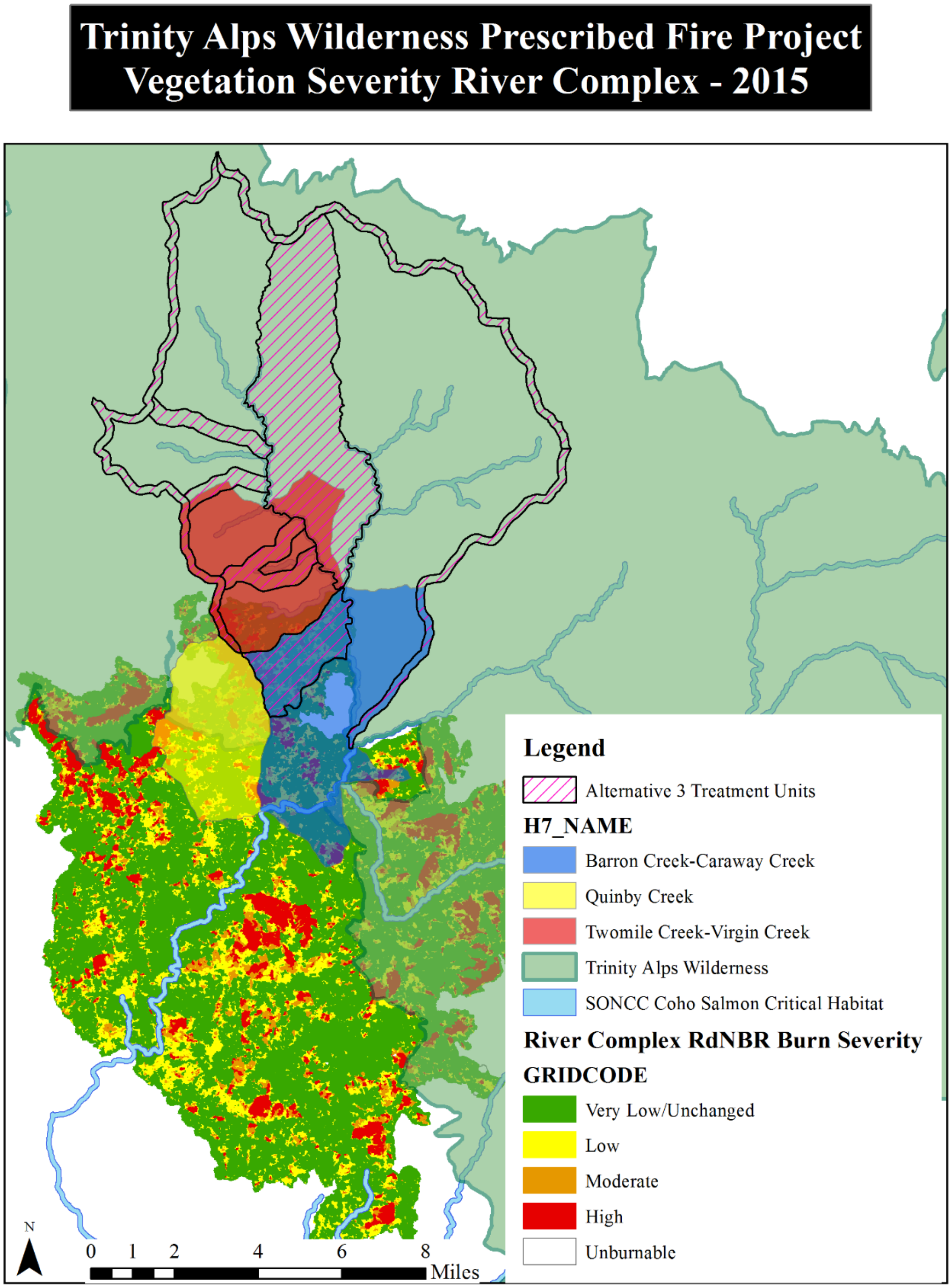
Post-fire changes to vegetation are quantified using the USDA Forest Service Normalized Burn Ratio (RdNBR)[3,4].

Table I-1: Acres burned in each burn severity class within the project area and treatment units (treatment unit burned area for alternative 3 is the same as alternative 2).

Burn Severity Class	Grid code	Acres Within Project Area	Acres within Units in Alternative 2
Unchanged	1	2,938	1,034
Low	2	1,333	599
Moderate	3	715	302
High	4	1,070	350

Unchanged: This severity class indicates that the area one year after the fire was indistinguishable from pre-fire conditions. This does not always indicate the area did not burn.
Low: Represents areas of surface fire with little change in cover and 10-25 percent mortality of the structurally dominant vegetation.
Moderate: This severity class indicates a mixture of effects on the structurally dominant vegetation, with 26-75 percent mortality.
High: Represents areas where the dominant vegetation has high to complete (75-100 percent) mortality.

Of the 6,055 acres that burned within the project area, the normalized burn ratio vegetation severity (RdNBR) data classified approximately seventy percent of the burned area as mostly unchanged to low-fire severity effects[5]. There are smaller portions (approximately thirty percent) of moderate- and high-severity classes. Overall, the fire that burned within the project area was of low to moderate severity and low to moderate intensity with about seventeen percent of the burn within the project area classified at high severity[5].



Normalized Burn Ratio (RdNBR) vegetation severity data is shown in relation to the Alternate 3 prescribed burn area outlines and the affect subwatershed areas.

This map uses the NAD 1983 UTM Zone 10N cordinate system and was produced on July 23, 2018 by A. Fleitz.

Figure I-1. River Complex post-fire vegetation burn severity (RdNBR) in the project area

Existing Conditions and Affected Environment

Affected Species

The conservation status of aquatic invertebrates on national forest lands was evaluated by the Region 5 Regional Forester's Sensitive Species List in the original BA, original supplemental BE, original fisheries MIS report and 2014 Fisheries Addendum.

Existing Habitat Conditions

The River Complex burned into three 7th-field subwatersheds in the project area, Barron Creek – Caraway Creek, Quinby Creek, and Twomile Creek – Virgin Creek. Barron Creek – Caraway Creek subwatershed provides 526 acres of riparian reserve and five miles of SONCC coho salmon critical habitat[1] within the treatment area. Twomile Creek-Virgin Creek subwatershed provides 741 acres of riparian reserve (Table I-2) and nine and a half miles of SONCC coho salmon critical habitat[1] within the treatment area. Quinby Creek subwatershed does not provide any riparian reserve or habitat for anadromous fish species within the treatment area.

Table I-2. Acres by Subwatershed[1]

5th Field Watershed	HUC	Watershed Acres	Total Acres Proposed for Prescribed Fire Treatments	Acres of Riparian Reserve for Prescribed Fire Treatments
New River	1801021110	149,359	19,064	4,506
7th Field Watersheds	**HUC**	**Watershed Acres**	**Total Acres Proposed for Prescribed Fire Treatments**	**Acres of Riparian Reserve for Prescribed Fire Treatments**
Barron Creek-Caraway Creek	18010211100402	10,587	2,706	526
Quinby Creek	18010211100401	5,630	6	0
Twomile Creek-Virgin Creek	18010211100103	7,506	3,000	741

Vegetation burn severity within the fire perimeter was calculated using RdNBR for the three affected subwatersheds and are shown in Table 3. Barron Creek-Caraway Creek had about thirty percent of its acreage burned at low, moderate, and high severities, while Twomile Creek-Virgin Creek had about eight percent and Quinby Creek had about forty-five percent of its acreage burned at low, moderate and high severities. When considering just the low-, moderate- and high-intensity burned acreage within the three subwatersheds, about seventy-two percent burned at low to moderate intensity and twenty-eight percent burned at high intensity. The River Complex fire did impact twenty-one percent of the total riparian reserve in the Quinby Creek subwatershed, six percent of the total riparian reserve in the Barron Creek-Caraway Creek subwatershed and six percent of the riparian reserves in the Twomile Creek-Virgin Creek watershed (Table I-4). Within the project area, twenty-eight percent of the riparian reserve was impacted in the Barron Creek-Caraway Creek subwatershed and two percent of the riparian reserve was impacted in the Twomile Creek-Virgin Creek subwatershed (Table I-5). The River Complex impacted approximately three percent of the riparian reserve within the project area along the New River.

Table I-3. River Complex Burn Severity (RdNBR) of Total Acres in HUC 7 Watersheds (in acres).

7th Field Watersheds	Total Acres	Unburned	Low	Mod	High	Total burned Low, Mod, High	% Burned Low, Mod, High
Barron Creek-Caraway Creek	10,587	7,444	1,703	774	666	3,143	30%
Quinby Creek	5,630	3,098	1,117	581	834	2,532	45%
Twomile Creek-Virgin Creek	7,506	6,880	232	121	273	626	8%

Table I-4. River Complex Burn Severity (RdNBR) within Total Riparian Reserves with the HUC 7 Watersheds (in acres).

7th Field Watersheds	Acres of Riparian Reserves	Unburned	Low	Mod	High	Total burned Low, Mod, High	% Burned Low, Mod, High
Barron Creek-Caraway Creek	1,913	1511	281	80	41	402	21%
Twomile Creek-Virgin Creek	1,964	1843	53	24	44	121	6%
Quinby Creek	1,339	958	219	85	77	381	28%

Table I-5. River Complex Burn Severity (RdNBR) within Riparian Reserves in the Trinity Alps Prescribed Burn Project Area by HUC 7 Watershed (in acres).

7th Field Watersheds	Acres of Riparian Reserves in Proposed Treatment Units	Unburned	Low	Mod	High	Total burned Low, Mod, High	% Burned Low, Mod, High
Barron Creek-Caraway Creek	526	380	93	35	18	146	28%
Twomile Creek-Virgin Creek	741	728	0	0	13	13	2%

Table I-6. River Complex Burn Severity (RdNBR) within Riparian Reserves within Proposed Prescribed Fire Treatments (in acres).

Treatment Unit	Acres of Riparian Reserves	Unburned	Low	Mod	High	Total burned Low, Mod, High	% Burned Low, Mod, High
Barron Creek	499	353	93	35	18	146	29%
Salmon Summit to Fawn Ridge	442	442	0	0	0	0	0%
Election Gap to New River	220	207	0	0	13	13	6%

Table I-7. Miles and acres of Critical Habitat within the project area. The critical habitat buffer is 300ft on either side of the designated critical habitat stream. Burn severity of Coho SONNC Critical Habitat discussed in acres.

7th Field Watersheds	Miles of Critical Habitat	Acres of Critical Habitat Buffer	Unburned	Low	Mod	High	Total Acres burned Low, Mod, High	% Burned Low, Mod, High
Barron Creek-Caraway Creek	5.0	106	101	4	< 1	< 1	5	5%
Twomile Creek-Virgin Creek	9.5	221	221	0	0	0	0	0%

The River complex burned into the 'Barron Creek', 'Salmon Summit to Fawn Ridge', and 'Election Gap to New River' proposed treatment units. The fire burned approximately 124 acres in the 'Salmon Summit to Fawn Ridge' unit, 1,128 acres in the 'Barron Creek' unit, and less than 1 acre in the 'Election Gap to New River' unit (Figure I-2). The riparian reserves within the 'Barron Creek' unit was involved in the fire, of which approximately twenty-nine percent burned at low, moderate, or high severity (Table 6). Approximately three acres burned at low severity within the SONCC coho salmon critical habitat buffer in the 'Barron Creek' unit (Table I-7). The 'Barron Creek' unit is proposed for prescribed fire of low-to-mixed severity, which will back downhill through the drainage towards the New River[1]. The riparian reserves in the 'Salmon Summit to Fawn Ridge' unit were not burned at low, moderate or high severity and there is no coho salmon critical habitat adjacent to this unit[1] (Table I-1). In the 'Election Gap to New River' unit approximately 13 acres of riparian reserves were burned at high severity, but no acres were burned at low, moderate, or high severity within the coho salmon critical habitat buffer. The 'Salmon Summit to Fawn Ridge' and 'Election Gap to New River' units are proposed for prescribed fire of low-to-mixed severity, with fire predicted to back downhill approximately 1,000 feet from the main ridgetops. The low acreage of high burn severity in the riparian reserves and coho salmon critical habitat from the River Complex will have little to no effect on the proposed actions within the three mentioned treatment areas for alternative 2 and 3.

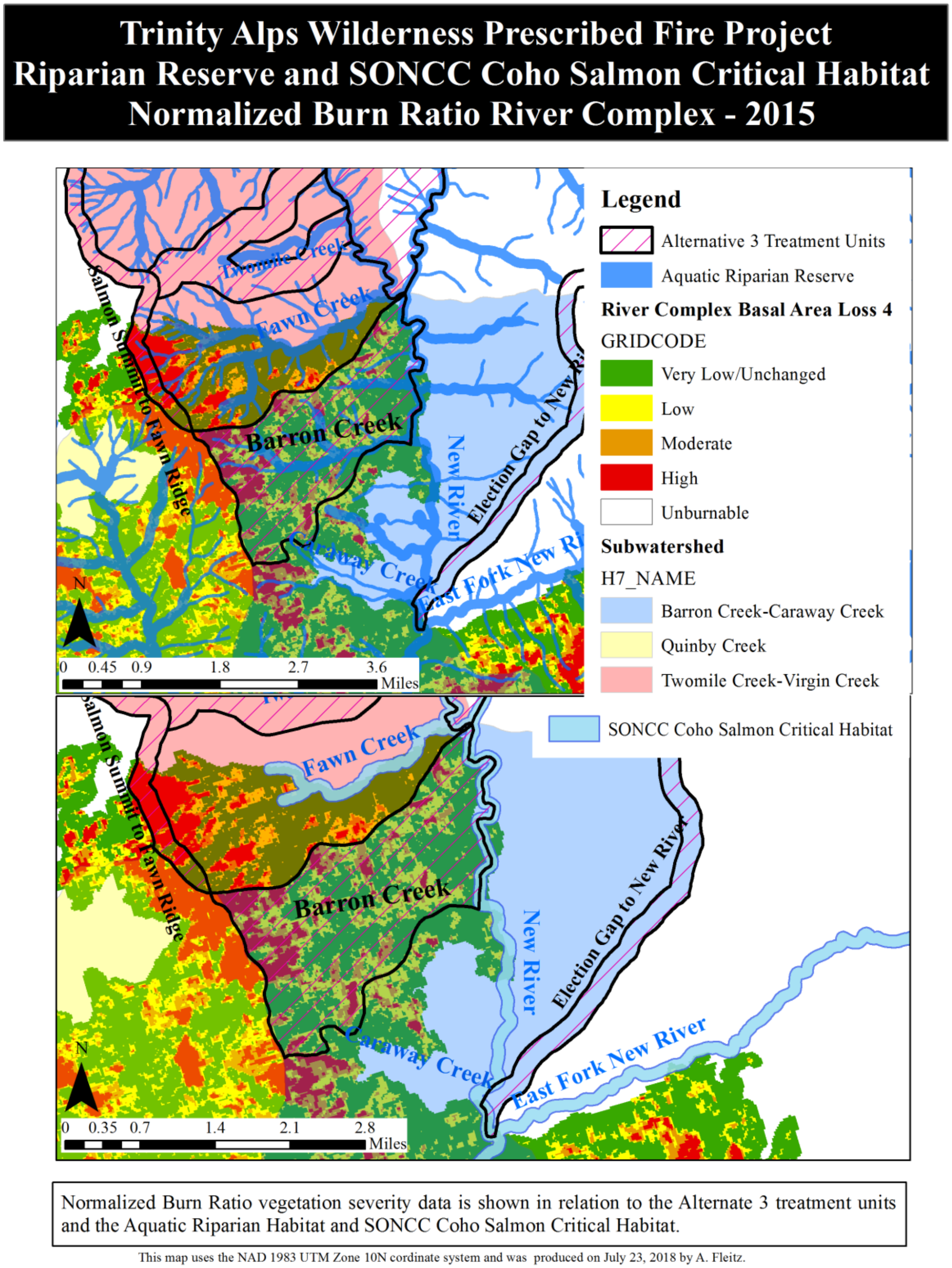


Figure I-2. River Complex post-fire vegetation burn severity (RdNBR) in the treatment units.

Environmental Consequences

As discussed on page 12 in the Fisheries BA for the Trinity Alps Wilderness Prescribed Fire project, there is no probability for proposed actions within the Quinby Creek subwatershed to affect anadromous fish or their habitat. Forty-five percent of the Quinby Creek subwatershed was burned during the River Complex fire at low, moderate, and high intensities. However, Quinby Creek does not have anadromous fish habitat and less than one percent of the watershed is proposed for prescribed fire. Thus, Quinby Creek subwatershed conditions post-fire combined with proposed actions would continue to have no effect to anadromous fish species and their habitat and this subwatershed will not be discussed further.

Alternative 1- No Action

Direct and Indirect Effects
The River Complex fire had moderate effect on the western portion of the project area. Current fuel and vegetation conditions within the project area following the River Complex still present a high risk of high severity wildfire, which could have adverse impacts to watersheds and streams and in turn have adverse impacts to anadromous fish, other aquatic species and aquatic habitats. The effects analyses in the fisheries BA and supplemental aquatic species BE remain valid. The direct and indirect effects analysis for Alternative 1 in the original fisheries MIS report remains valid.

Effects Common to Both Action Alternatives

Direct, Indirect and Cumulative Effects
The changed condition due to the River Complex fire burning in the Barron Creek – Caraway Creek and Twomile Creek – Virgin Creek subwatersheds is unlikely to have measurable direct or indirect effects on soil, water, or geologic resources as they relate to the Trinity Alps Prescribed Fire Project. Additionally, there were no effects from the River Complex fire to the other five 7th-field subwatersheds included in the action area. As a result, there would not be direct effects to aquatic species or their habitats, nor any measurable changes from indirect effects to habitat indicators including water quality, habitat access, habitat elements, channel condition and dynamics, flow hydrology and watershed conditions as a result of the River Complex Fire.

The direct, indirect and cumulative effects analyses in the original fisheries BA, supplemental aquatic species BE and fisheries MIS report remain valid. The Endangered Species Act and Essential Fish Habitat effects determinations in the fisheries BA remain valid. The sensitive species determinations in the supplemental aquatic species BE remain valid. There is no change to the management indicator analysis summary.

References – Appendix I

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